

Evaluation of Liquid Substances on Teeth Surfaces

My problem for this experiment is “Do liquids we drink like Coca-Cola, orange juice, spring water, or Gatorade breakdown or dissolve your teeth?” If so, which drink breaks down your teeth the most?

Research

The human permanent tooth formula is 2123/2123, which means humans have 2 incisors, 1 canine, 2 pre-molars, and 3 molars in each quadrant of their mouth.² The part of the tooth above the gum is called the crown and the part below or in the gum is called the root. There are four parts of a tooth, the enamel, the cementum, the dentin, and the pulp.³ The enamel is the strongest part of the human body. It covers the dentin above your gum and gets up to about two and a half millimeters thick. The enamel is made up of 96% mineral and the other 4% is made of water and organic material by weight. The enamel’s main material is hydroxylapatite.⁵

The cementum is located between the enamel and the dentin.³ Its main purpose is to protect the root of the tooth although; the cementum only covers two-thirds of the root’s surface area. The cementum’s other use is the ligaments in our gums attach to it to keep the tooth in place.⁶ It is made up of 45% non-

organic material, 33% organic material, and 22% water.⁵ Two main minerals in the cementum are hydroxylapatite and collagen. The mineral collagen found in our teeth is found also in our bones.⁷

The dentin is located between the cementum and the pulp of the tooth.³ Its two main uses are it supports the crown of the tooth and it acts as a protective layer. The dentin is made up of 70% non-organic material, 20% organic material, and 10% water.⁵ Like the cementum, the dentin has some of the mineral collagen in it.⁸

The pulp is located inside of the dentin and is the center part of the tooth.³ It is used to bring nutrition to the tooth, create dentin while the tooth is forming, and to rebuild damaged dentin.⁹ The pulp is made up of nerves, blood vessels, and a soft connective tissue. The nerves and blood vessels lead up into the pulp from a small hole in the bottom of the dentin.¹⁰ There are four layers of the pulp, the pupil core, the cell rich zone, the cell free zone, and the Ondontoblastic layer.¹¹

One of the liquids I am using in this experiment is Coca-Cola. Coca-Cola consists mainly of carbonated water and high fructose corn syrup. High fructose corn syrup consists mainly of fructose that comes from corn, and glucose. It is

used as a sweetener in some bread, soft drinks, yogurts, cereals, soups, and more.

Many companies use high fructose corn syrup instead of regular sugar because they can get the same amount of sweetness using a smaller amount of syrup than regular sugar, it mixes better than sugar, and it is cheaper. Other ingredients in Coca-Cola are caramel color, phosphoric acid, many oils, extracts, and flavors, and caffeine. ¹ Caffeine is a minorly addictive substance.

Another liquid I am using is orange juice. Orange juice is made by extracting juice from an orange. Many times producers of orange juice add acids, vitamins, flavorings, or preservatives to their orange juice to help it stay fresh, taste good, or smell fresh. They sometimes even add omega-3 which is normally found in fish and nuts or even calcium that is found in milk and some nuts. If the juice is pasteurized it usually means that the producer added what is called a flavor pack. A flavor pack is used to give the juice more flavor because producers normally evaporate some of the water found in the juice naturally so it is cheaper to ship. ¹³

The next liquid I am using is Gatorade. Gatorade is owned by the Pepsi Company. It is a sports drink claimed by the producers that if you drink their product while being active that it will make you have better performance.

Gatorade has chemicals in it that will help quench your thirst faster than regular water. It has many acids, preservatives, chemicals, and flavorings. Gatorade also has a small amount of coloring.

The last liquid I am using is spring water. Spring water is water that has naturally been filtered through underground minerals and rocks that comes out through an opening in the earth. Small amounts of minerals usually collect in the water such as calcium or magnesium.

Hypothesis

My hypothesis is Coca-Cola will breakdown the teeth the most out of all of the drinks I am using because many people think Coca-Cola is bad for your teeth.

Materials

4 teeth, spring water, orange juice, Coca-Cola, red Gatorade, tbsp measuring tool, caliper, 4 jars, tweezers, paper towels, and small labeled plastic bags

Procedure

- 1: Get some teeth from a dentist or veterinarian and select 4 that are about the same size. (I used dog teeth because they are almost the same thing.)
- 2: Measure each tooth's weight on a very accurate chemical scale and record.
- 3: Measure each tooth's length with a caliper and record.

- 4: Fill four jars, one with 2 tbsp spring water, one with 2 tbsp orange juice, one with 2 tbsp Coca-Cola, and one with 2 tbsp red Gatorade.
- 5: Drop one tooth in each jar and make sure you know which tooth is in each jar so you can match the correct measurements in the end.
- 6: Every 24 hours dump the liquid out of the jars, rinse them, then refill the jars with the same type of drink they had before, and drop the teeth back in the jars.
- 7: After ten days of the teeth soaking, take the teeth out of the drinks and let them dry.
8. Measure the length and weight of each tooth and compare the after measurements to the before measurements to see how much the tooth gained or lost.

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