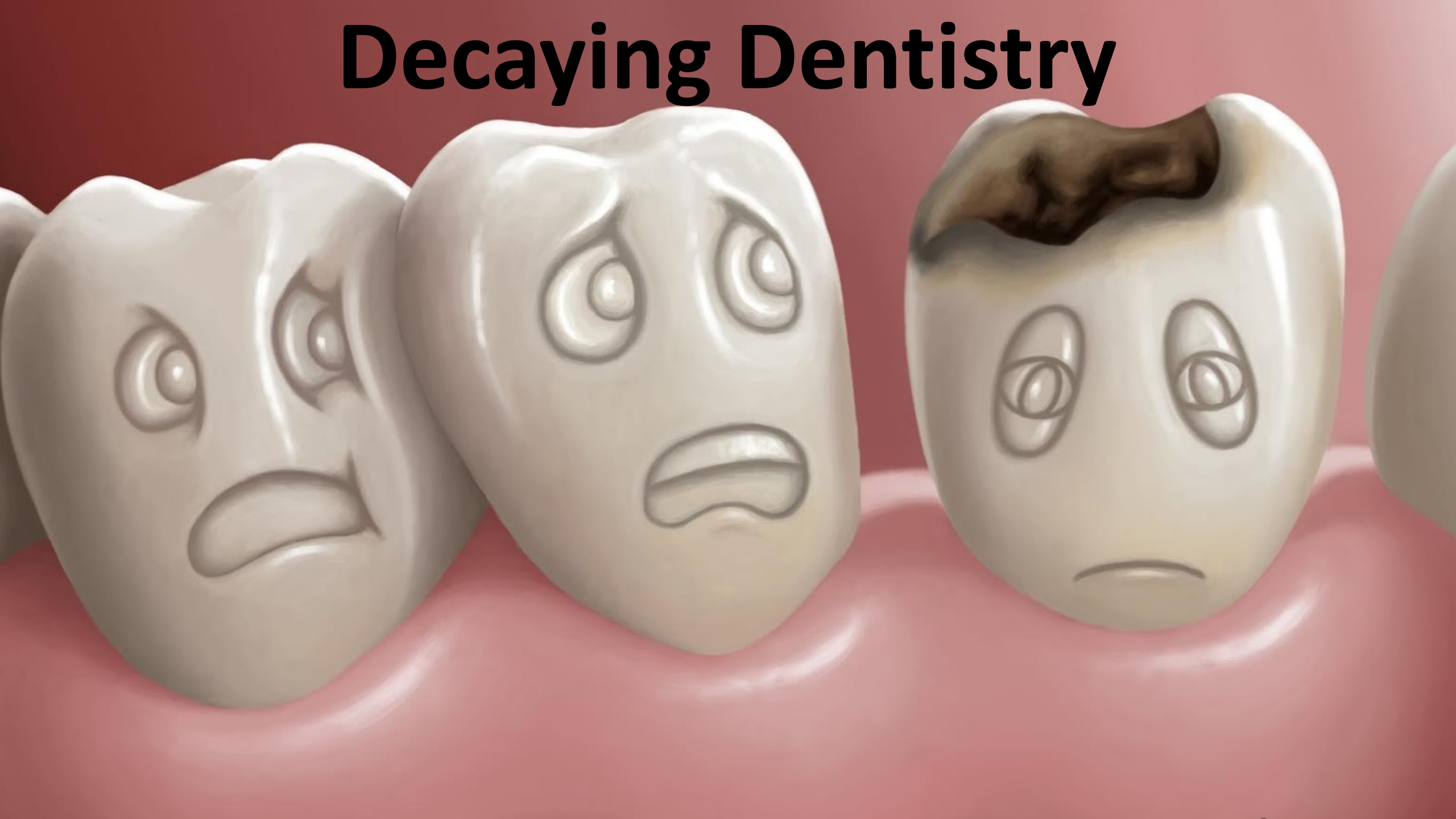
Decaying Dentistry



Introduction

I chose this project to experience the aftermath of how different drinks effect the health of teeth. Since my mom saved all my baby teeth, I decided to use those teeth in my experiment. I wondered how soaking teeth in various beverages would change the outer material of each tooth.

I hope this science project shows that water has no harmful effect on teeth while other varieties of beverages have damaging effects.

Background Information:
Researching Impact of Beverages on Tooth Health

- Carbonated soft drinks and fruit juices have high sugar content and are acidic
  - Sugar and acid can lead to tooth enamel erosion and cavities
- Coffee is acidic and contains chromogens
  - Chromogens are natural compounds that cling to tooth enamel and cause yellowing or brownish staining
- Carbonated water contains carbon dioxide
  - Carbon dioxide forms carbonic water acid when mixed with water leading to erosion of enamel
- Milk contains an excellent source of calcium and phosphorous
  - Calcium and phosphorous minerals help to repair tooth enamel and prevent decay
- Water contains fluoride
  - Fluoride helps to neutralize acids produced by bacteria in the mouth

Question:
Which drink is most undesirable for tooth health?

In this experiment, I will be testing Coca Cola, orange juice, coffee, carbonated water, milk, and water to determine which drink has the most detrimental effect on teeth.

I will be inspecting each tooth for the speed of disintegration, changes in texture, formation of stains, and the amount of decay.

Hypothesis

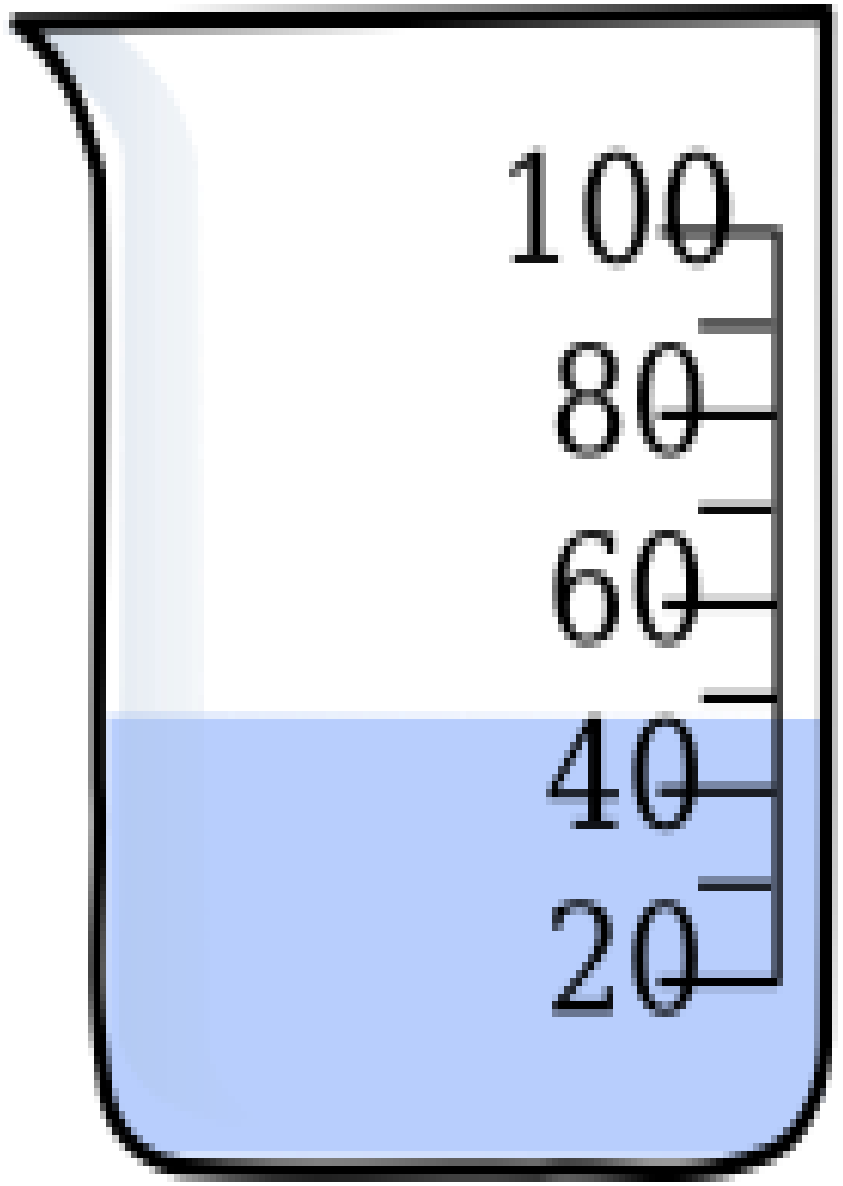
I wonder which drink is the most harmful for tooth health?

I think the tooth soaked in Coca Cola will decay the quickest and result in the darkest stains.

* After my research on how various beverages effect tooth health, I have discovered that acid, sugar, and chromogens all are harmful for teeth.

Materials

- Six 100 ml clear plastic beaker measuring cups
- Fourteen 10 oz cans of Coca Cola
- One 46 fl oz container Simply Orange Juice (medium pulp)
- 50 ml of Peet's caffeinated coffee (freshly brewed daily)
- Fourteen 12 oz cans of Polar Seltzer Water
- One gallon container whole milk
- 50 ml tap water from City of Tucson water company
- Six of my baby teeth in good condition (stain-free and cavity-free)
- One set of sterile tweezers
- One black Sharpie Marker
- Fourteen paper plates
- One 12 in ruler



Set Up Procedures

- Label name of beverage on each clear plastic beaker with black marker
- Pour 50ml of each beverage into assigned beaker
- With tweezers, place one baby tooth in each beaker

Procedures for Continuing Care

Daily Care

- Remove tooth from each beaker with tweezers
- Place tooth on a clean paper plate
- Pour out prior day's fluid from each beaker
- Rinse out each beaker with running water from kitchen faucet
- From each beverage container, pour 50 milliliters of beverage into assigned beaker
  - *Open and pour from a new can of carbonated water and Coca Cola each day to experience greatest amount of carbonation*
- Use tweezers to place each tooth back into assigned beverage beakers

Daily Tooth Measurements

- Speed of disintegration
- Texture
- Stains
- Amount of decay

Variables

Independent variable

- Type of beverage poured into each beaker

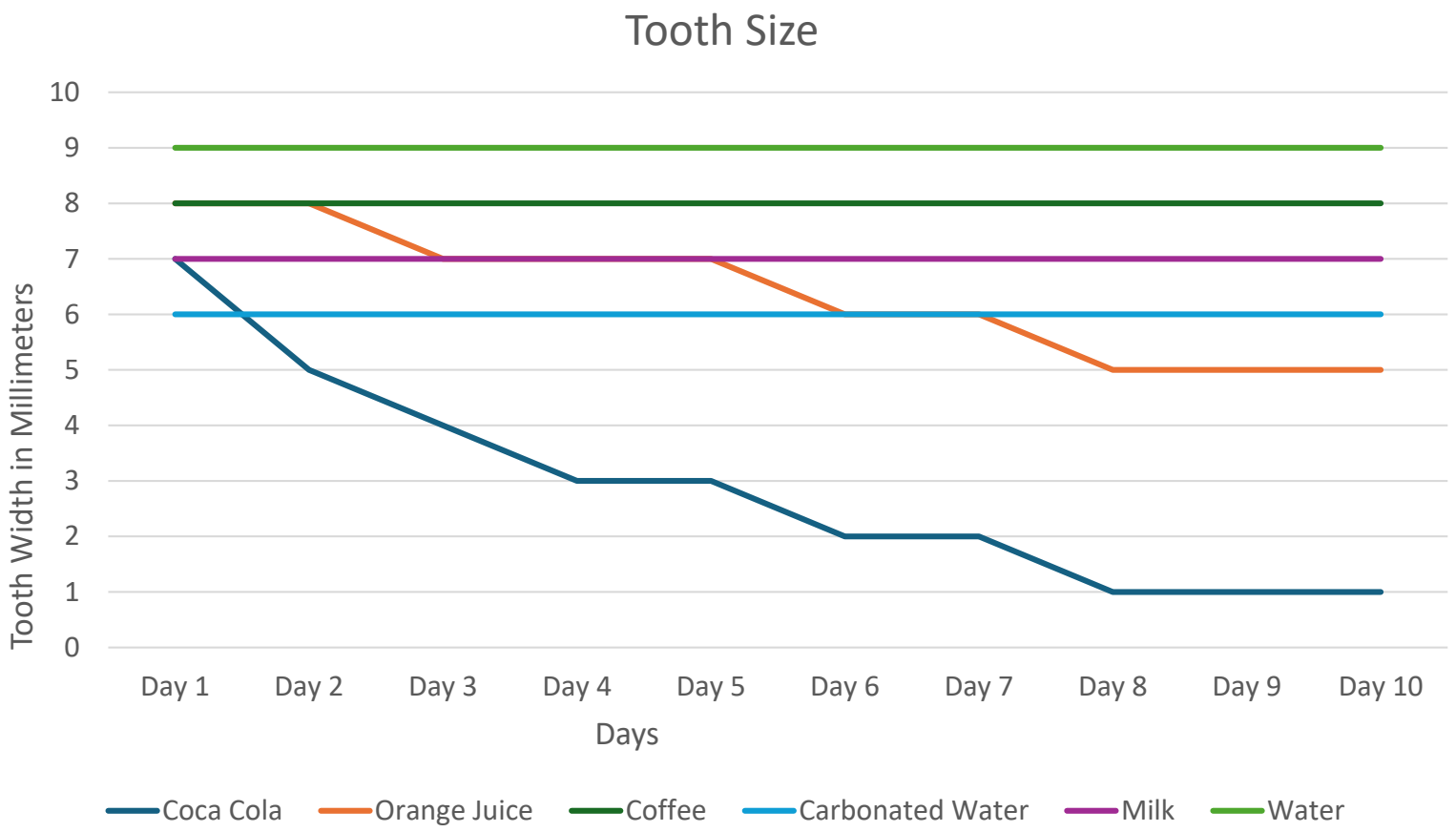
Control variables

- Time
- Temperature
- The amount of beverage poured
- Number of teeth
- Type of teeth
- Same size beakers

Dependent Variables

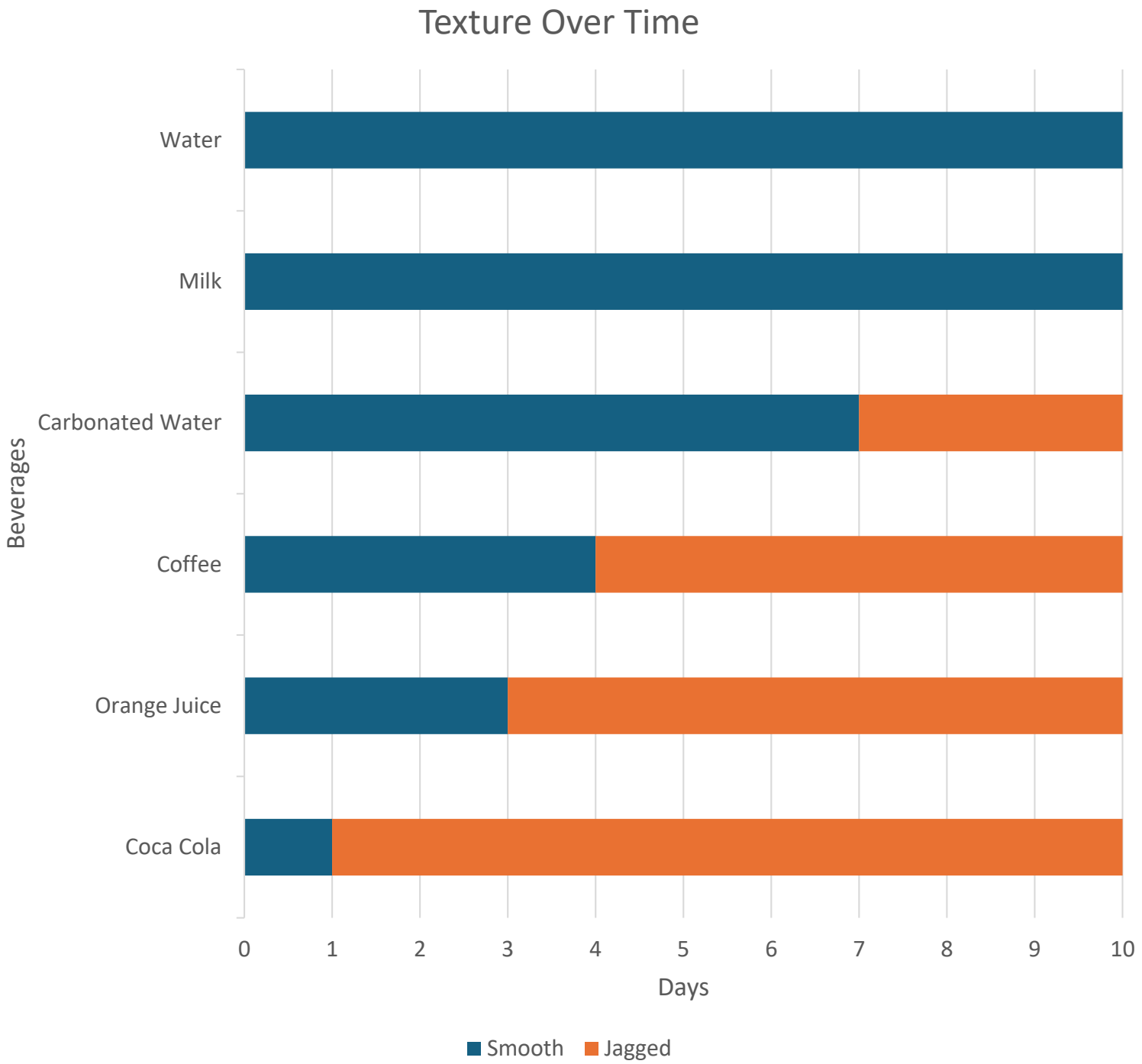
- Amount of disintegration on each tooth
- Texture changes
- Color of each stain
- Speed of decay

Disintegration



Texture

OJ
Coffee


Texture Over Time
Water
Milk
Carbonated Water
Coffee
Orange Juice
Coca Cola
Beverages
0
1
2
3
4
5
6
7
8
9
10
Days
Smooth
Jagged

Stains

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Water	None	None	None	None	None	None	None	None	None	None
Milk	None	None	None	None	None	None	None	None	None	None
Carbonated Water	None	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Coffee	None	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown
Orange Juice	None	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown
Coca Cola	None	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown

Outcome of the Experiment

Although my experiment was interesting, the outcome was not very surprising. Based on my background research, teeth soaked in sugar, acidic liquid, and carbonation have the most detrimental effect on the enamel. This was the outcome of this experiment.

For example, the tooth soaked in Coca Cola was the leader in all the categories including quickest deterioration, darkest stains, and roughest texture.

However, the tooth soaked in water was the tooth most unaffected by stains, texture, and deterioration.

Variability in Tooth Size

The sample size would have been more effective if I used the same exact type of teeth. However, the teeth used varied in size and shape because I used an assortment of my baby teeth. Included in the sample were incisors and molars. Overall, I think the deterioration, texture, and staining resulted in the same outcome regardless of tooth size and shape.

Takeaway

Sugar has the most detrimental impact on teeth. Coca Cola and orange juice have a high sugar content, and they were leaders in tooth damage.

Acid has the second most harmful impact on teeth as the teeth soaked in Coca Cola, orange juice, coffee, and carbonated water all showed significant tooth erosion.

I learned that minerals found in milk and water such as phosphorous, calcium, and fluoride help to repair tooth enamel and prevent decay.

Implications and Ideas for Future Research

The information gathered in this science project is important for world health. Major companies sell acidic drinks that contain chromogens and sugar. These products decay tooth enamel at an alarming rate. Tooth decay has direct effects not only on teeth but can even lead to blood clots and cancer. More awareness of the importance of tooth health can save lives for people all over the world. This would lower the cost of health insurance and keep people out of overcrowded hospitals.

If I were to do this research again, then I would study the effects with additional beverages such as fluoride-free water, teas, and energy drinks. I would also use a magnifying glass when measuring the deterioration of each tooth to increase accuracy.

Since I have been able to think about the end of my project, I have been wondering about the effects of soaking teeth in fluoride-free water. If there was no effect on the tooth, would water companies continue to use fluoride in our drinking water?

References

The Sugar-Rotten Teeth Connection | Penn Dental Medicine

Is Milk Good for Your Teeth? The Truth About Calcium and Tooth Health