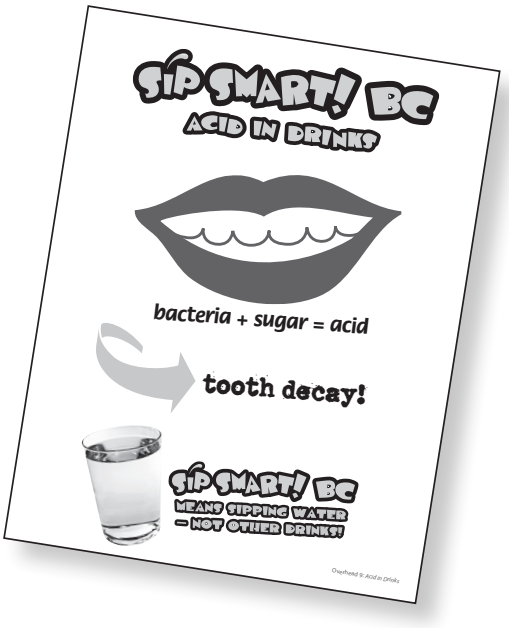
Activity 4. "Tooth" Experiment, Part 1 *(15 - 20 mins)*

Key Messages

• Some ingredients in sugary drinks other than sugar, such as acid and caffeine, can damage our health.

Objectives

• To connect dental health with healthy drink choices.
• To follow the scientific method and report observations on the effect of acid on dental health



Preparation

You need:
• 1 can regular cola
• 1 can diet pop
• 1 can clear pop
• 1 can energy drink
• 1 apple juice box
• 1 glass of water
• 6 clear containers (about 200 mL), ideally with lids.
• 6 pieces of bone

Also:
• Make overhead transparency Overhead 9: *Acid in Drinks*.
• Make overhead transparency Overhead 10: *"Tooth" Experiment Report*.
• Copy Handout 16: *Observations of "Tooth" Experiment* for each student.
• Review Backgrounder: *The "Tooth" Experiment (page 120)*.
• Review Assessment Tool: *Observations of "Tooth" Experiment*.

Activity

Level 1 and Level 2

• Ask students to suggest reasons why acid may harm their teeth.
• Use Overhead 9: *Acid in Drinks* to explain the impact of sugar and acid on our teeth.
• Put students into 6 groups and assign 1 drink and 1 piece of bone to each group.
• Distribute Handout 16: *Observations of "Tooth" Experiment*.
• Ask students to do the following:
  1. Write the drink they are observing on the sheet.
  2. Hypothesize what they think will happen where it says "Based on what I already know, I think…"
  3. Draw a picture of their "tooth" and make observations of what they see, smell and feel.
  4. Place 1 bone piece in their plastic container.
  5. Fill their container with approximately 125 mL of their drink to be observed (e.g. pop).
  6. Write the liquid used on the plastic container.
  7. Leave the container untouched until the next ***Sip Smart! BC***™ lesson.
  8. Hold on to their handout; it will be completed in the next lesson.
  9. Ask each group to share their hypothesis and collect the ideas on Overhead 10: "*Tooth" Experiment Report*. (Overhead will be completed in Lesson 4)

Activity Tips

This is a scientific experiment that is to be carried out in groups. Students will observe how sugary drinks can affect teeth.

Instead of teeth, you will be using a small piece of bone, which contains calcium and shares many of the same materials as teeth. See Backgrounder: *The "Tooth" Experiment (page 120)* for information about bone preparation. In this lesson, students will set up the experiment. To obtain best results, the pieces of bone should sit submerged for approximately 2 weeks.

Through testing, we've discovered that using: water, cola, diet cola, clear pop, energy drink, and apple juice will likely get you the most interesting variety of results *(see details on page 120)*. While students may find it boring to observe the "tooth" in water, it is important as a comparison and for drawing conclusions.

What is the impact of acid and sugar on our teeth?

- Sugar + bacteria (in our mouths) ➥ acid.
  This acid attacks our teeth, and, over time, causes decay.
- Many sugary drinks are very acidic, which adds even more acid to what our mouths produce.
- The combination of acid and sugar in sugary drinks can lead to severe tooth decay.

It is important to be sensitive to students' backgrounds. If using an animal bone as a "tooth" is not appropriate for a student's culture and/or religion, see Backgrounder: *The "Tooth" Experiment* for alternate material.

The Punchline!

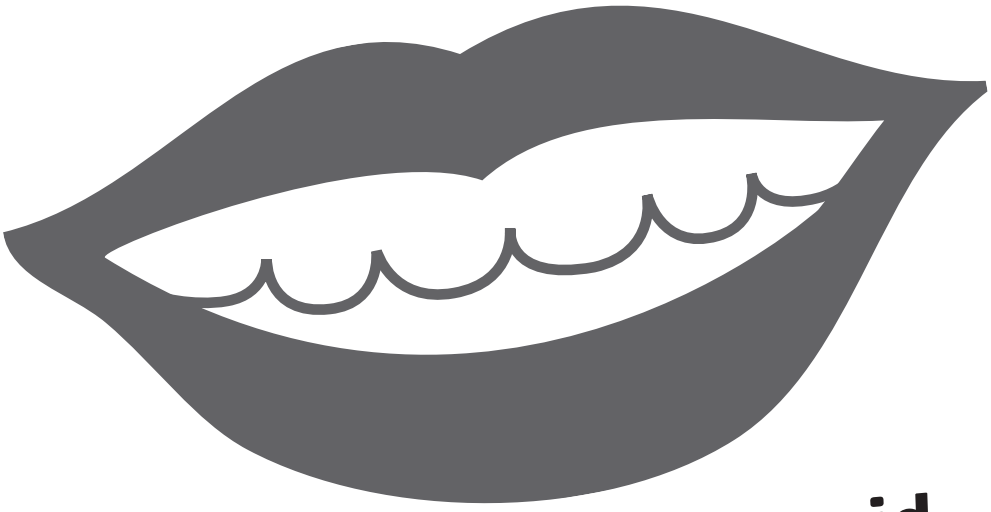
This is an experiment, following the scientific method, to find out the effect of drinks (with different amounts of acid in them) on "teeth".

We will check the "teeth" to observe changes after 2 weeks.

Teachers say:
"This experiment is well worth the effort!"

Sip Smart! BC

Acid in Drinks



bacteria + sugar = acid

tooth decay!

Sip Smart! BC means sipping water – not other drinks!

Overhead 9: *Acid in Drinks*

Sip Smart! BC™ Observations of "Tooth" Experiment

Name: _____

Drink being observed: _____

Use your senses to observe your "tooth". What does it look like? What colour is it? How big is it? What does it feel like? How does it smell?

➲ FIRST OBSERVATION:

What I observe: _____	*Drawing of "tooth" before the experiment:*
_____	
_____	
_____	
_____	
_____	

Hypothesis:

Based on what I know, I think...

_____

_____

_____

➲ FINAL OBSERVATION:

What I observe: _____	*Drawing of "tooth" after the experiment:*
_____	
_____	
_____	
_____	
_____	

Conclusion:

_____

_____

_____

Handout 16: *Observations of "Tooth" Experiment*

Sip Smart! BC™ "Tooth" Experiment Report

Drink	Hypothesis	Observation
Regular cola		
Diet cola		
Clear pop		
Energy drink		
Apple juice		
Water		

Overhead 10: *"Tooth" Experiment Report*

Teacher Assessment Rubric

Observations of "Tooth" Experiment

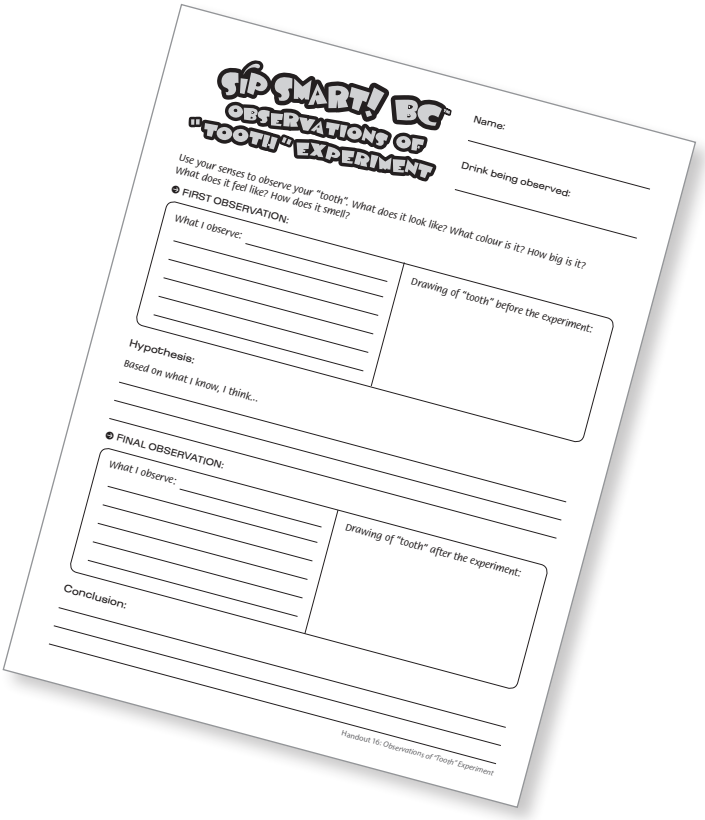
Level 1 and Level 2

Name: _____

First observation addresses colour, texture and shape of "tooth"	8	6	4	2
First drawing matches first observation	8	6	4	2
Identifies ingredients of assigned drink in hypothesis (Does it contain sugar or acid?)	8	6	4	2
Predicts impact of ingredients on "tooth"	8	6	4	2
Second observation addresses clear differences in colour, texture and shape of "tooth"	8	6	4	2
Second drawing matches second observation	8	6	4	2
Conclusion demonstrates understanding of how the ingredients in the drink contribute to "tooth" erosion and theoretical decay	8	6	4	2
Score	_____ **/ 56**			

Key:

8 = Exceeding expectations
6 = Meets expectations
4 = Approaching expectations
2 = Not yet meeting expectation



The "Tooth" Experiment

Part 1: Sipping Sugary Drinks and Acid Attacks

Acids are chemicals that are sometimes added to foods and drinks to alter taste and act as a preservative. One of the properties of acid is that it dissolves things.

When a person sips a sugary drink, an 'acid attack' occurs in the mouth for up to 20 minutes. The acid demineralizes the tooth during the attack and weakens the tooth. After about 20 minutes, saliva remineralizes the tooth and strengthens it. This balancing act becomes greatly challenged when a person snacks frequently on sticky foods, or sips regularly on sugar-laden drinks.

A case-in-point:

- A child takes a drink of pop and there is a 20 minute acid attack.
- The body is about to remineralize the tooth but the child takes another sip so there is another 20 minute acid attack.
- This pattern continues throughout the day. The balance is offset and the demineralization time outweighs the remineralization time and tooth decay begins.

The good news is that children can sip water all day with no worries of acid attacks on their teeth. However, if children are having a sugary drink during the day (e.g. fruit juice or pop), then they should drink it in as few sips as possible. The same applies to sugary drinks, when they are consumed as a once-in-a-while treat!

After having a sugary drink health professionals recommend rinsing your mouth with water, a fluoride mouth rinse or chewing sugarless gum. Anyone of these actions will help neutralize the acid found in the drink.

Interestingly, brushing of the teeth is not recommended. The enamel of the teeth is in a weakened state because of the erosion caused by the acid in a drink, so the mechanical abrasion of the brush actually exacerbates the problem.

Part 2: *The "Tooth" Experiment*

It is important to note that the *"Tooth" Experiment* does not simulate the processes occurring in the mouth after sipping a sugary drink. In placing the bone or "tooth" in different acidic sugary drinks, the only factor acting on the "tooth" is the acidity of the drink. There are no normal mouth bacteria present. Recall that when a child sips a sugary drink, the sugar interacts with the bacteria in the mouth to produce acid. Once this acid is made, it lasts for about 20 minutes, after which the saliva in the mouth neutralizes the acid, and the "acid attack" ends.

The *"Tooth" Experiment* does show the process of tooth erosion, whereby an acidic liquid chemically erodes away the hard mineralized surface of the "tooth". Although the experiment cannot accurately capture all of the factors in the mouth that contribute to tooth decay, it is currently the best tool that we have to demonstrate the harmful effects on teeth. This hands-on approach gives an idea of the harmful effects of sugary drinks on their teeth.

In the spirit of experimentation, other drinks could be used, but we haven't tested these or provided information in the resources. Plain milk may be used but it should be refrigerated and the experiment completed before the best before date, to simulate real drinking conditions. We trialed 100% orange juice and noticed that it often grew mold.

References

Sharon Melanson, Dental Hygienist, BC Interior Health Authority, 2008