Backgrounders

Water

Our bodies need water to cool off by sweating, carry nutrients (vitamins, minerals, glucose, oxygen, fats) to cells, carry waste (carbon dioxide, lactic acid, etc.) away from cells, digest food, maintain bowel regularity and blood pressure, maintain kidney health, lubricate joints, allow muscles to contract, and many other vital bodily functions.

Our bodies are made up of approximately 65% water.

Children (9 - 12 years old) need about 8 cups of fluid each day (about 1L of water for every 1,000 calories burned). The best way to judge if we are drinking enough fluids is to monitor urine output: we should urinate every 2 to 4 hours, and the urine should be pale yellow (like lemonade) not dark (like apple juice).

Dehydration occurs if we don't get enough water or other fluids. We may feel tired, dizzy, have difficulty concentrating, have a headache, perform poorly at sports, have an increased heart rate, and muscle cramps. At extreme levels of dehydration we can become delirious, have complete muscle and nervous system failure, and die.

Features of tap water:

- It is easily available in most places – drinking fountains, taps in kitchens and bathrooms.
- It is cheaper than bottled water.
- Drinking water keeps us hydrated without adding sugar, sodium or caffeine to our diets.
- There is no evidence that bottled water is safer than municipal tap water (excluding local conditions).
- Empty (often plastic) bottles require energy to be recycled and add more non-biodegradable waste to the landfills.
- Energy is used to bottle water and fuel is used to transport it to stores.
- Potentially harmful toxins (e.g. bisphenol-A) can leach out of some plastic bottles.
- It is possible that some bottled water, such as demineralized water or distilled water is simply tap water that has undergone a process to lower the mineral content and to remove chemicals such as chlorine (Health Canada, *Frequently Asked Questions about Bottled Water*, 2016).

Note: Under some circumstances tap water can be unsafe. For example, untreated or inadequately treated water from wells and other sources can contain sufficient numbers of disease-causing organisms such as bacteria, parasites and viruses that cause illness. Under these circumstances, bottled water would be a safer choice.

References

HealthLink BC, *Drinking Enough Water*, November 2014

Flavoured and Vitamin-Enhanced Water

Most of these products try to give people the idea that they will add to your health and well-being but they are NOT necessary for good health. Some popular brands have between 6-8 teaspoons of sugar, while others may be sweetened with an artificial sweetener. Many also contain caffeine.

Drinking too much of these products can result in an excess intake of vitamins, minerals and caffeine, which can be unsafe. It is important to read the label to find the maximum amount that can be consumed on a daily basis. These products should be kept out of children's reach and are usually not recommended for children.

What About Coconut Water?

Coconut water and coconut milk are not the same thing. Coconut milk is used for cooking rather than drinking.

The nutrition in coconut water can vary with the age of the plant. Generally, plain coconut water has much less sodium, much more potassium and less carbohydrate than commercial sports drinks. Coconut water can be a source of hydration, but water works just as well.

But...most coconut drinks contain added sugars, often as much as pop. Companies now make flavoured blends, which can have added sugar or fruit juice. A latte blend of coconut water is made with coffee and therefore has caffeine. It is important to read the ingredient list to know what you are drinking!

References

Ontario Society of Nutrition Professionals in Public Health (OSNPPH), *Sip Smart!™ Ontario Teacher Resource Guide*, 2016 (adapted with permission)

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References

Ontario Society of Nutrition Professionals in Public Health (OSNPPH), *Sip Smart!™ Ontario Teacher Resource Guide*, 2016 (adapted with permission)

Milk, Flavoured Milk and Other Beverages Made With Milk

Milk and milk alternatives (e.g. unsweetened fortified soy beverage) are the main source of calcium and vitamin D in most Canadian diets. Both calcium and vitamin D help build and maintain strong bones and teeth. Plain milk is also a source of protein, vitamin A, and riboflavin.

Young children (9 months-2 years) are advised to drink homogenized (3.25%MF) plain milk, while after age 2, everyone is encouraged to choose lower-fat options (2%MF or less). Lower-fat plain milk has the same nutrients as higher fat plain milk with less fat.

One cup (250 mL) of plain milk = 1 serving from the Milk and Alternatives food group in *Eating Well with Canada's Food Guide* and in *Eating Well with Canada's Food Guide - First Nations, Inuit and Métis*. Children aged 4-13 should aim for 2 to 4 Food Guide Servings of Milk and Alternatives each day.

Reduced-Sugar and Flavoured Milk

Adding vanilla, chocolate, strawberry or other flavours to plain milk can add a lot of extra sugar. Some flavoured milks have 20 grams or less sugar per 250 mL. These reduced-sugar flavoured milks are a "sometimes" choice. Regular flavoured milks will contain more added sugars and should be consumed even less often. It is best to offer children plain (not flavoured) milk regularly so they learn to enjoy it. If making flavoured milk at home, add a small amount of syrup or powder. Less is best.

Milkshakes

Milkshakes are made from milk, ice cream or iced milk, often with added flavourings, syrups or sauces. Milkshakes will have a lot more sugar and fat than plain milk. Even without adding any extra syrups, 1 cup of plain ice cream has almost the same amount of sugar as a can of pop.

Store-bought Smoothies

Store-bought smoothies often contain as much sugar as a milkshake. Don't be fooled by the advertising that suggests smoothies are a healthy choice because they contain fruit! Once you see how much added sugar is in many store-bought smoothies, you can understand why smoothies made with whole fruits and plain milk or yogurt are healthier drink choices.

Hot Chocolate and Specialty Drinks

A hot chocolate or specialty coffee drink can have the same amount of sugar as 2 cans of pop. The sugar comes from the chocolate or chocolate mix and the added whipped cream, marshmallows, and chocolate syrup. Skipping the additions, asking for "half sweet" and choosing a smaller serving size can reduce the sugar; however, the sugar can really add up if consumed frequently.

Coffee drinks are not recommended for children. Not only do they often contain high amounts of sugar, but they also contain caffeine. . Kids do not need caffeine!

References

OSNPPH, *Sip Smart!™ Ontario Teacher Resource Guide*, 2016 (adapted with permission)

Plant Based Beverages

Plant based or non-dairy beverages are made from plants such as soy, rice, almonds, hemp or flaxseed. They may be used by someone who avoids milk, either because of a cow's milk allergy, lactose intolerance, or personal, cultural or religious preferences and dietary practices, such as a vegan diet, which does not include animal products.

Only unsweetened soy beverages fortified with calcium and vitamin D count as a milk alternative in *Eating Well with Canada's Food Guide* and in *Eating Well with Canada's Food Guide – First Nations, Inuit and Métis*. Unsweetened fortified soy beverages have added vitamins and minerals, and a similar amount of protein to make them a nutritionally adequate alternative to cow's milk.

Other plant based beverages can be a good source of calcium and vitamin D if they are "enriched" or "fortified" with these nutrients. Choose unsweetened plant based beverages instead of the sweetened, flavoured varieties to get calcium and vitamin D without added sugar.

References

OSNPPH, *Sip Smart!™ Ontario Teacher Resource Guide*, 2016 (adapted with permission)

Healthlink BC, *Food Sources of Calcium and Vitamin D*, August 2014

Health Canada, *Canadian Nutrient File*, April 2012

Sugar

A. What are sugary drinks?

Sugary drinks are drinks (carbonated or not) that contain added sugars.

- Pop or soft drinks
- Energy drinks
- Hot chocolate
- Store-bought smoothies
- Slushes
- Fruity drinks (e.g., "punches", "cocktails" or "-ades")
- Sports drinks
- Flavoured or vitamin-enhanced waters

Added sugars are sugars and syrups that are added to drinks or foods during processing (e.g. sugars added to pop by the manufacturer) or preparation (e.g. sugars added to a cappuccino after it was bought at the coffee shop). Sugary drinks often have little to no nutritional value. These drinks "bump out" the nutritious drinks and foods our bodies need to be healthy. For example, children and adolescents who drink pop regularly are more likely to have lower intakes of calcium and other nutrients.

Naturally occurring sugars are no different from added sugars in terms of their effects on the body. However, because drinks with naturally occurring sugars often contain important nutrients, they can be consumed in moderation as part of healthy eating. Some drinks with naturally occurring sugar are 100% fruit juice (contains fructose), and plain milk (contains lactose).

Hidden sugars are other names for added sugars that might not sound or look like sugar. These include: sucrose, dextrose, dextrin, maltose, galactose, liquid glucose-fructose, invert sugar, raw cane sugar, brown sugar, corn sweetener, high-fructose corn syrup, rice syrup, concentrates of fruit puree or fruit juice, honey, malt syrup, and molasses.

What about **artificial sweeteners**?

In keeping with the *Guidelines for Food and Beverage Sales in B.C. Schools*, drinks sweetened with artificial sweeteners such as aspartame, acesulfame potassium and sucralose are not allowed in elementary and middle schools (but allowed in secondary schools as *Sell Sometimes* items). Just like sugary drinks, artificially sweetened drinks get children used to sweet-tasting, non-nutritious items. They provide none of the nutrients that a child's growing body needs to be healthy and strong, and can bump healthy foods and drinks out of the child's diet. These drinks may also contain artificial sweeteners in amounts that exceed the acceptable daily intake (ADI) for children.

References

HealthyFamilies BC, *Facts About Sugary Drinks*, August 2013

BC Ministry of Education and BC Ministry of Health, *Guidelines for Food and Beverage Sales in B.C. Schools*, 2013

HealthyFamilies BC, *Your Guide to Sugar Part 1 and Part 2*, January 2015

Caffeine

Caffeine is a mildly addictive stimulant drug that stimulates the central nervous system and can cause side effects such as: irritability and restlessness, difficulty concentrating, and an increased need to urinate.

Caffeine occurs naturally in some drinks, (coffee, tea and hot chocolate) and is added to others (cola and energy drinks).

Nutrition labels rarely include the amount of caffeine contained in a food product.

Some of the ingredients indicating the presence of caffeine in a food or drink include: coffee or coffee beans, green or black tea leaves, guarana, yerba/yerba mate, and cocoa beans.

Health professionals suggest that children aged 7 - 12 get no more than 65 - 85 mg of caffeine each day, as even low levels of caffeine can affect most childrens' behaviour. Withdrawal symptoms may be felt by children consuming even small amounts of caffeine. Symptoms might include headaches, irritability and restlessness.

References

Health Canada, *Caffeine in Food*, February 2012

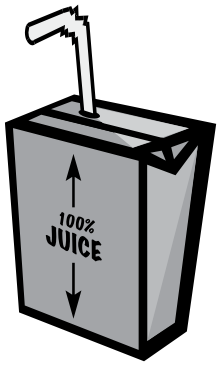
Juices and Fruity Drinks

The difference between 100% fruit juices and "fruity drinks" (e.g., "fruit beverages", "fruit drinks", "fruit cocktails") can be a difficult concept for the students to grasp, but is a very important teaching point. Although the majority of added sugar being consumed by students often comes from these drinks, they – and often their parents – may not know the difference between 100% fruit juice and fruity drinks.

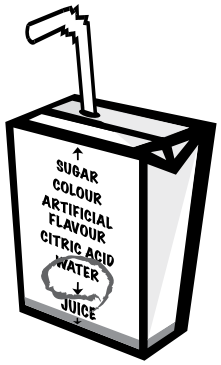
100% fruit juice contains some of the natural vitamins (such as vitamin C, potassium and B-vitamins) found in fruit. However, fruit juice still contains a lot of concentrated sugar, and has the same effect on teeth as other sugary drinks. For this reason, children should have no more than 1 serving (125 mL or 1/2 cup) of fruit juice each day. A healthier alternative to 100% fruit juice would be a glass of water and fresh fruit, which provides all the vitamins, minerals, and fibre naturally present, but with much less sugar! Juice is not a necessary part of a healthy diet. Fruits and vegetables are!

Fruity drinks have added sugar along with other additives that are not good for growing children. Added sugars in fruit drinks (those that are not labelled "100% juice") can be particularly inconspicuous, because these drinks are often labelled to look healthy:

- Fruit nectars or juice blends contain added sugar and only 50% or more juice content.
- Fruit drinks, cocktails and beverages contain added sugars and less than 50% juice.



Juice labelled "100% fruit juice" or "unsweetened 100% juice".



Drinks that are not 100% juice contain only a small amount of juice or none at all.

What about vegetable juice?

Juice can be made from vegetables (e.g., tomatoes, carrots, celery, beets, parsley, lettuce, watercress, spinach). They are often high in added salt (sodium). Some vegetable juices can have fruit juice or sugar added to them. A healthy alternative to vegetable juice would be a glass of water and fresh vegetables, which provides all the vitamins, minerals and fibre naturally present, but with much less sugar!

Fortified juices

Some juices, such as orange juice, may be fortified with added calcium or vitamin D. These juices have the same amount of calcium or vitamin D as plain milk or unsweetened fortified soy beverage, but are much lower in protein and should not be used to supplement calcium and vitamin D requirements on a regular basis.

Are unpasteurized fruit juices and ciders safe?

Not for everyone. Infants, young children (ages 5 and under), older adults, and people with weakened immune systems (such as those with HIV or those being treated for cancer) are most at risk. Unpasteurized juice or cider does not undergo the treatment needed to kill harmful bacteria. Often they are sold at health food stores, local orchards, roadside stands, farmers' markets, country fairs and juice bars. Unpasteurized juice or cider may also be found on ice or in refrigerated display cases and in produce sections at grocery stores.

References

The following sections were adapted with OSNPPH permission from *Sip Smart!™ Ontario Teacher Resource Guide*, 2016: *What about vegetable juice?, Fortified juices, Are unpasteruized fruit juices and ciders safe?*

HealthlinkBC, *Unpasteurized Fruit Juices and Ciders: A Potential Health Risk*, February 2010

Health Canada, *Food &Nutrition/Food Safety/Unpasteruized Fruit Juice and Cider*, August 2007

Sports Drinks

Sports drinks are generally made up of water, sugar and a small amount of sodium and potassium. They often contain artificial colours and/or flavours, artificial sweeteners and other additives.

Sports drinks were originally designed to keep athletes hydrated and performing optimally when they are engaged in vigorous continuous activity lasting longer than 90 minutes. The premise is that sugar provides some energy, and electrolytes (sodium and potassium) replace what the body loses through sweat. However, they have no nutritive benefits for young athletes involved in sports of lower intensity and duration.

More recently, these drinks are increasingly being consumed by, and marketed to, children and teens, the majority of whom have no need for them. If children are engaged in endurance sports, it is healthier for them to have:

- regular water breaks every 15 or 20 minutes.
- a healthy snack during breaks.
- water and a healthy snack after a game or workout.

For an easy and healthy way to replace the sodium and potassium lost in sweat, active children can drink plain chilled milk/unsweetened fortified soy beverage, which provide all the electrolytes young athletes need, with no added sugar. Plain milk and unsweetened fortified soy beverage also contain calcium for healthy bones.

The table below compares the ingredients in a sports drink to those in plain milk:

	Sports Drink (250 mL/1 cup)	Plain Milk (250 mL/1 cup)
Sugars (g)	14	12
Sodium (mg)	107	120
Potassium (mg)	36	365
Other nutrients	None	Calcium, protein, vitamins A and D, riboflavin, B12
Sports Recovery	Good	**Very Good**

When is a sport drink appropriate?

Prolonged, vigorous, "elite" (e.g. provincial level soccer player) level sport

AND

Hot, humid conditions
OR
wearing heavy protective gear (e.g., goalie pads and uniform)

AND

More than 60-90 minutes without stopping

References

Brian D. Roy, *Milk: the new sports drink? A Review*, Journal of the International Society of Sports Nutrition, October 2008

Energy Drinks

Energy drinks contain as much or more added sugar than cola, are high or very high in caffeine, and often contain potentially harmful additives. Energy drinks are often marketed with images of extreme sports such as competitive downhill skiing, biking, snowboarding and skateboarding, with the implication that these drinks boost performance. Others, with flashy packaging and enticing names are designed to directly target the youth market.

Energy drinks are very high not only in sugar, but also in caffeine. For example, 1 500 mL can of a typical energy drink contains 160 mg of caffeine. That is more than double the suggested daily caffeine maximum for a 7-12 year-old child.

The table below compares the caffeine content in pop and coffee to that of some common brands of energy drinks:

Product	Caffeine Content
Can of Cola (355 mL)	35 mg
Coffee House Grande Latte	70 mg
Canned Energy Drink (500 mL)	160 mg

Many energy drinks also contain stimulant herbs or other substances such as guarana and taurine. These additives are often listed misleadingly as "medicinal ingredients" on energy drinks, when in fact they are untested and potentially harmful, especially for children. Like sports drinks, energy drinks also tend to contain artificial flavours and/or colours.

When consumed in large amounts, or when combined with alcohol, energy drinks have been linked to serious health effects such as irregular heart function, nausea and vomiting, and electrolyte disturbances. Energy drinks can also interact with some medications.

References

HealthLinkBC, *Energy Drinks*, February 2015

Ingredients on Labels

A food additive is any substance that is added to a food or drink in order to preserve it, maintain its quality or make it more appealing. More than 850 additives are authorized by Health Canada for use in Canada. Below are some examples of common food additives you can find on the ***Sip Smart! BC***™ *Drink Cut-outs*. ***Sip Smart! BC***™ *Drink Cut-outs* represent some of the most common drinks consumed by Grade 4-6 students in BC.

Food Additive	Examples
Gelling and thickening agent: thicken drinks to give body and texture	carageenan, ester gum, maltodextrin
Anti-caking agent: allows powders to run freely	trisodium phosphate, disodium phosphate, tricalcium phosphate, monopotassium phosphate
Vitamins and amino acids: nutrients that are needed in small amounts for growth and good health. Because the body cannot make them, you need to get them from what you eat and drink	pantothenic acid (vitamin B5), vitamin A palmitate, taurine
Naturally occurring substances: may have health benefits but little to no quality research exists to prove this claim	glucoronolactone, inositol
Phytochemicals: compounds that are produced by plants	lutein
Sweeteners: sweeten food without adding calories	acesulfame-potassium, aspartame, mannitol, sorbitol, xylitol
Acids: give a sharp flavour and act as a preservative	citric acid, sodium citrate
Oils: thicken foods to give texture and body	vegetable oil
Plant extracts: may have some health benefits but are not tested in children for safety, may contain caffeine	ginseng, guarana, yerba mate

What about % Daily Value?

The % Daily Value represents the percentage of a recommended daily amount that 1 serving of this food or drink provides.

For example, a label may show that a serving of a drink provides 15% of the daily recommended amount of vitamin C. This means you still need another 85% to meet the recommended goal. The % Daily Value is based on a 2,000-calorie diet for adults older than 18.

References

Eat Right Ontario. Table adapted from: *Facts on Food Additives*, 2016

Health Canada, *Frequently Asked Questions About Nutrition Labelling*, December 2009

Health Canada, *Lists of Permitted Food Additives*, 2013

Guide to Making Healthy Drink Choices

Choose most	Choose sometimes	Choose least or not at all
Water – great for keeping a person hydrated, and for sipping all day	**100% juice** – has naturally occurring sugar, but may also contain vitamin C and A, folate, potassium, and antioxidants (125 mL or 1/2 cup of juice is enough for 1 day)	**Sports drink** – has high sugar content; is intended for use during / after intense and continuous physical activity lasting longer than 90 minutes
Plain milk – has some naturally occurring sugar but also contains key nutrients like protein, calcium, vitamins A and D **Plain milk alternative:** unsweetened fortified soy beverage	**Reduced sugar flavoured milk** (e.g. chocolate, strawberry) – contains more sugar than plain milk but has just as much nutritional value – reduced sugar milks will have 20 grams or less sugar per 250 mL **Reduced sugar flavoured milk alternative:** Reduced sugar flavoured fortified soy beverage	**Fruit drink** – contains only a small amount of real juice; most of the flavour comes from sugar; fruit drinks may also be called fruit "cocktails", "blends" or "beverages"
		Pop – is high in sugar and has no nutritional value; cola often contains caffeine
		Diet pop – has no sugar, contains artificial sweeteners and acid (harmful to teeth), no nutrients, and sometimes caffeine
		Energy drink – has high sugar content and high or very high caffeine content; may also contain other harmful additives
		Regular flavoured milk/fortified soy beverage – contains more sugar than plain or reduced sugar flavoured milk

References

Consistent with BC Ministry of Education and BC Ministry of Health, *Guidelines for Food and Beverage Sales in B.C. Schools*, 2013

Reference for "choose most definition" adapted from Alberta Health Services, *Healthy Eating for Children and Youth in Schools*, 2012

Choose Most

Foods and drinks in the "choose most" category can be consumed daily, in appropriate amounts and portion sizes. These foods are recommended as healthy choices in *Eating Well with Canada's Food Guide* or *Eating Well with Canada's Food Guide - First Nations, Inuit and Métis.* and have little or no added sugar, fat or sodium (salt).

The students will likely ask a number of questions. Here are answers provided by registered dietitians:

Q1. *What about hot chocolate vs. chocolate milk?*

A1. Hot chocolate is rarely prepared with milk and is considered a sugary drink that usually contains 24 g (6 sugar cubes) added sugar and 7 mg of caffeine per 250 mL. Chocolate milk contains 8 g (2 sugar cubes) added sugar and 7 mg caffeine per 250 mL, but also nutrients such as calcium, vitamin D, riboflavin, and phosphorus.

Q2. *What about diet pop vs. pop?*

A2. Both contain artificial colours and flavours, and both may contain caffeine, but neither contain important nutrients for growing bodies.

Q3. *What about homemade iced tea vs. commercially prepared iced tea?*

A3. Homemade iced tea may be made with herbal (caffeine-free) teas. The amount of added sugar may be controlled and smaller amounts consumed than the sugar contained in commercially prepared iced tea.

Q4. *What about herbal tea vs. green tea/black tea?*

A4. Herbal tea (technically not a real "tea" but an infusion) is usually naturally caffeine free. Both green tea and black tea contain caffeine.

How to calculate the results of the *Sip Smart!™ Drink Diary*:

On our ***Sip Smart! BC™*** website www.bcpeds.ca you will find the *Drink Diary Calculator* in the form of an EXCEL™ Spreadsheet that makes it easy to calculate the total sugar cube, water, pop, milk and caffeine intake per class.

Just download the *Drink Diary Calculator* to your computer and run it in EXCEL™. It takes about 10 minutes to put all of the students' drinks into the *Drink Diary Calculator.* In Grade 6, this could be done by a group of students as an extension activity. However we suggest you replace the student's name with a number, at the top of the sheet, before giving to students.

If you have questions about using EXCEL™ *Drink Diary Calculator,* please review our brief online tutorial available from the Programs and Resources page of the BC Pediatric Society website. Visit www.bcpeds.ca and, from the left navigation bar, select "SipSmart! BC™", then "Teachers" and then "Drink Diary Calculator".

We've included a list of drinks that are not easy to categorize below. Use your best judgement if in doubt and/or refer to the Brand Name Food List (see *List of Links* in Online Resources setion).

1. *Lemonade* is a sugary drink as it has very little fruit juice in it.

2. *Chocolate milk* is a dairy item, with its own category in the *Drink Diary Calculator* to account for the caffeine in it.

3. *Flavoured milk* is where you would put milkshakes, smoothies and drinkable yogurt as they have some naturally occurring lactose and nutrition, but also contain added sugar. The *Drink Diary Calculator* will tally added sugar only.

4. *Hot chocolate* is generally made from a powdered mix reconstituted with water. Therefore, it counts as a sugary drink. While we acknowledge that hot chocolate does contain a small amount of caffeine, we still feel it is a better fit in the sugary drinks category.

5. *Vitamin-enhanced waters are also categorized with diet pop* (not diet cola) as they have similar ingredients. Both are artificially sweetened and thus contain few "sugar cubes" but offer no other nutrients.

This activity invites students to share personal information. It is important to remember that some families do have challenges in providing enough nutritious foods and/or regular meals in the home environment. It is important to maintain an atmosphere of respect, by not judging what students report or exerting any pressure on them. *[Adapted from Healthy Eating and Physical Activity Learning Resource, BC Ministry of Education and Ministry of Health]*

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 their 1 serving (1/2 cup or 125 mL) of 100% fruit juice during the day (which contains a significant amount of naturally occurring sugar and is acidic), 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

Preparing Bones for the *"Tooth" Experiment*:

1. Shopping

Ask a butcher to cut a beef marrow bone (soup bone) into 1 cm thick slices.

You will get about 6 - 10 "teeth" per slice and to carry out the experiment as described, 6 pieces are necessary.

2. Cleaning

Soak the gristly bones in warm water overnight. Remove the gristle of the bone gently with a paring knife.

3. Cutting

To quickly cut bones into pieces, use a bolt cutter. You can also use a band saw or hit the bone with a hammer or a hammer and chisel (wear eye protection).

If you use a bolt cutter it works best when the bones are wet and soft.

Cut the bones in a safe environment as pieces may fly off in several directions.

Alternatives:

Demonstration using extracted adult teeth

Oral surgeons may be willing to save extracted adult teeth (usually un-erupted wisdom teeth) for classroom experiments. After extraction, the oral surgeon will rinse the teeth with water to remove blood before sending them to you. They should be stored in a dilute solution of bleach (9 parts water to 1 part bleach) to act as a disinfectant. Once received, the teeth can then be thoroughly cleaned with a toothbrush. Any remaining tissue will not interfere with this experiment. The teeth should then be stored in new dilute bleach solution until required. The teeth should be rinsed with water to remove traces of bleach before starting the experiment. For protection against such things as viruses, **the teacher should use gloves** when handling the teeth.

If using bone or extracted adult teeth is not appropriate for some students' culture and/or religion, or if you don't have enough time to do the entire experiment, teachers have also demonstrated the acidic nature of sugary drinks by placing a copper penny in an acidic liquid such as cola. Although the penny will become shinier, this is essentially due to the top layer of metal being etched away. This is an important distinction to be made as students could easily confuse this corrosive result with cleaning (or erroneously believing that drinking cola will clean their teeth).

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