

# Sugar Sugar

## Teacher's Guide

**Introduction:** Follow sugar's intriguing travels through history, why we love it, and places it loves to hide. Join the debate surrounding high fructose corn syrup. Learn to figure how many grams and calories are in a teaspoon of sugar. Discuss the worries about non-nutritive sweeteners.

### Optional Props:

World map, and a white board OR poster board OR a flip chart  
10 pound sack of sugar, 4 # sack of sugar and box of sugar cubes  
A measuring teaspoon, a table knife  
7 red apples, an egg, a cup of rice and an ear of corn  
Box of Lucky Charms  
1 can regular cola  
3 regular Oreo cookies and 3 Tablespoons of ketchup  
Regular size Snickers bar  
Bottle of Bull's-Eye Barbecue sauce  
7-11 Super Big Gulp cup  
Clean mat that can bend or cookie sheet to work on to capture your sugar  
Samples of sugar-free gum, cookies or candy, and packets of artificial sugar

### Brief History of Sugar

*(Teachers, put a world map where all your audience can see it. Point to New Guinea which is north of Australia; then Asia, India, Persia (Iran) France and England)*

Sugarcane was domesticated some 10,000 years ago on the island of New Guinea. Natives chewed a stem until the taste hit their tongue like a starburst. It was featured in ancient New Guinean myths - where the first man made love to a stalk of cane yielding the human race.

Sugar spread slowly from island to island, reaching Asia around 1000 B.C. By A.D. 500 it was being processed into a powder in India and used as a medicine. From there it spread to Persia (name changed to Iran in 1935) where Arab armies fell in love with sugar, and it was like the moment "sugar hit the fan". Whatever countries the armies conquered they brought with them sugar and how to produce it. Even the British and French crusaders fighting in the Holy Land took memories of sugar home with them.

Sugarcane needs tropical, rain-drenched fields to flourish, so European explorers were on the lookout for suitable islands. When Columbus set off on his second voyage to the New World, he carried cane. Thus dawned the age of big sugar, of Caribbean islands and slave plantations. The Portuguese made Brazil into an early boom colony, with more than 100,000 slaves churning out tons of sugar. Sugar moved from a luxury spice classed with nutmeg and cardamom to a staple.

*(Teachers, on your world map, when the time is right, point out the Caribbean islands, and the three way trade of London, England, Amsterdam or Paris and then the west coast of Africa.)*

Refining sugar was brutal. The heat of the fields, the flash of the scythes, the smoke of the boiling rooms and the crush of the mills. By 1700 Caribbean islands were cleared, planted with cane and the need for cheap workers created the "three way trade". Milled sugar cane filled ships carried to London, Amsterdam or Paris to be traded for finished goods which were then sailed to the west coast of Africa and traded for more slaves. For these slaves, life on these Caribbean islands was hell. Fingers caught in the millstones meant your hand was cut off, and to be caught running away was to lose a leg. Until the slave trade was banned in Britain in 1807, more than 11 million Africans were shipped to the New World - more than half ending up on sugar plantations.

### **No stopping the tide, the more you taste, the more you want.**

In 1700 the average Englishman consumed 4 pounds of sugar a year.

By 1800 the common man ate 18 pounds.

In 1870 the yearly consumption was 47 pounds.

By 1900 he was up to how many pounds a year? *(audience guesses, Answer, 100 pounds.)*

Today, the average American consumes 77 pounds of added sugar annually which is **22.7 teaspoons a day**. That is over 7 1/2 10# bags of sugar! *(Show 10# bag)*

*(Teachers, measure 22.7 teaspoons on to a mat, or pan. Divide into three piles - 11.6 teaspoons, 8.2 teaspoons and 3 teaspoons. Let audience count teaspoons out loud.)*

**11.6 of your teaspoons are sucrose which is table sugar, 8.2 teaspoons are high-fructose corn syrup and 3 teaspoons are honey, molasses, maple syrup etc.**

Food labels show sugar in grams, a measurement we are not use to using.

**1 gram of sugar = 4 calories. 1 teaspoon of sugar is 4 grams which is 16 calories.**

*(Teachers, write formula on flip chart). 4 calories x 4 grams = 16 calories = 1 teaspoon.*

On food labels, divide the sugar grams by 4 to get teaspoons of sugar.

A food product with 20 grams of sugar per serving = 5 teaspoons of sugar.

**Added sugar does not count what you put in your coffee, tea or sprinkle on your cereal. How many calories in our daily 22.7 teaspoons of sugar?**

**22.7 teaspoons times 16 equals over 363 calories. Lots of people eat way more.**



**Audience, shout out names for FDA approved sugars on food labels. *check list.***  
*(There are 19 listed)*

**White sugar, brown sugar, corn syrup & solids, high-fructose corn syrup, honey, molasses, maple syrup, nectars ( e.g. peach, pear, apple) powdered sugar, raw sugar** (minimally processed with higher molasses content, chunky),  
**invert sugar** (sucrose split into glucose & fructose, usually doesn't crystallize),  
**agave syrup** (same plant makes tequila, highly processed, more calories than sugar),  
**malt sugar** (grain soaked, germination stopped, dried, starches turning to sugar, used to make Malted milk, Whoppers candy, Malt O Meal, and beer).  
**sugars ending in "ose"**, dextrose, fructose, lactose, maltose, and sucrose.

Lactose is a milk sugar while fructose is found in fruit. If a food product has no fruit or milk products in it, **all** of the sugar grams listed on the label are added sugars.

*Teachers ask "Why is sugar added to processed food? Let audience guess.*  
*Answers - to enhance flavor, texture and may act as a preservative to extend shelf.*  
*Teachers, hand out boxes, sacks or labels of food. Have class figure teaspoons of sugar per serving on their label. Is serving amount what you would eat? Or is it less. Count # of sugars.*

### **Lets compare added sugar to natural sugars**

*(Teachers, bring out the samples you have. You can turn examples into questions.)*

Your 22.7 teaspoons of **added** sugar per day equals the **natural** sugar contained in

7 red apples	7.5 cups of fat-free milk (less than 2 quarts)	
454 eggs	1,135 cups of rice	27 ears of corn

### **The American Heart Association Recommends *(Teachers, write on flip chart)***

Daily intake of added sugars be limited to

**Men** - 150 calories which is 9 teaspoons, **Women** - 100 calories which is 6 teaspoons

### **But in reality the United States daily average of added sugars has been**

In 1970 we daily took in **333 calories** from added sugars (19.98 teaspoons)

By 1999 we were eating **422 calories** in added sugars daily (25.32 teaspoons)

As mentioned, by 2013 we ate 22.7 teaspoons daily, **about 378 calories** .

### **Where is that sneaky sugar hiding?**

Four slices of beef or pork bologna has 1.18 teaspoons of sugar

One cup of Lucky Charms has 2.55 teaspoons of sugar

A 12 ounce can of regular cola has 7.93 teaspoons *(Teachers have class guess)*

Three Tablespoons of ketchup has 1.77 teaspoons of sugar

Three Oreo cookies has 2.49 teaspoons of sugar.

Eight oz. of low fat fruit yogurt can have 6.16 teaspoons of sugar

(Teachers, hand out this quiz sheet, and read the first paragraph.)

**Candy Quiz.** The word CANDY comes from Arabic "qandi" for sugar confection. Americans spent \$32 billion for candy in 2011, eating 25 pounds per person.

Number of Snickers bars that equal 25 pounds of sugar. \_\_\_\_\_

Which candy bar actually started out as a trio in 1932 - individual bars filled with chocolate, vanilla and strawberry nougat. During World War II, sugar rationing made producing all three flavors too pricey, so only the chocolate was made.

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**Hidden Sugar Quiz - put a check by your choice**

1. Which breakfast cereal has the **most sugar** per serving?

Kellogg's Frosted Mini-Wheats  
Post Cocoa Pebbles  
General Mills Raisin Nut Bran

2. Which of these snacks has the **least sugar**?

A 4-ounce serving cup of Seneca Original Applesauce  
A 6-ounce container of Yoplait Original 99% Fat Free Lemon Burst  
Three Pepperidge Farm Mint Milano cookies

3. Which of these snacks has the **most sugar**?

A quarter-cup of Ocean Spray Craisins, Original  
A quarter-cup of Sun-Maid Yogurt Raisins  
One Twinkie snack cake

4. How many sugar cubes' worth of sugar in 7-Eleven Super Big Gulp Coca-Cola?

12 cubes 23 cubes 32 cubes (*Teachers, show your Super Big Gulp cup.*)

5. If you are going to eat dessert or sweets, Its better for your body to get sugar from:

Molasses or honey  
High-fructose corn syrup or other corn sweeteners  
Whether it's called sugar, honey or sweetie pie, sugar is sugar.

**Answers:** 200 Snickers bars, Three Musketeers 1. General Mills Raisin Nut Bran, 2. Three Pepperidge Farm Mint Milano cookies. 3. A quarter-cup of Ocean Spray Craisins, Original. 4.(*Teachers, count out 32 cubes.*) 5. Whether it's called sugar, honey or molasses, sugar is sugar.



**All sugars are not equal because they are metabolized differently in the body.**

Sucrose is table sugar from sugar beets or sugarcane. (2 teachers wear signs, act out)

**Sucrose** is 50% Glucose and 50% Fructose

**Glucose** is metabolized throughout the body. But **fructose** is processed mainly in the liver into fats, which can build up causing a fatty, dysfunctional liver.

A lot of the triglycerides (a type of fat) are pushed out into the blood. The resulting risks: obesity, hypertension, insulin resistance, and type 2 diabetes.

Change the percentages of glucose to 45% and give 55% to fructose and you have made the darling of food manufactures and the villain of good food choices.

**High-fructose corn syrup** is made cheap by government corn subsidies. It was first added to processed food in the 1970's. Check the label on every food and drink item and weep. In sodas, sports and sweet tea drinks there is no fiber to slow digestion.

A 2012 bottle of Bull's-Eye barbecue sauce had tomato puree, sugar, vinegar, molasses, salt, less than 2% honey, natural smoke etc.

A 2013 bottle has more High-fructose corn syrup than tomato puree!

(Teachers, pass new bottle of Bull's-Eye around the classroom so everyone can read the label).

**Who are the top consumers of high-fructose corn syrup**

United States - 51 pounds annually per capita

Mexico - 32 pounds

Canada - 23 pounds

South Korea - 15 pounds

**If sugar is so bad for us, why do we crave it?**

An injection of sugar into the bloodstream stimulates the same pleasure centers of the brain that respond to laughter, rewards and addictions like heroin and cocaine. It seems our tongue is also sometimes the master in what food we desire!

**But sugar has a sharply pronounced effect, in this sense it is literally an addictive drug.**

**"We have a big problem. Our world is flooded with fructose, but our bodies evolved to get by on very little"** Kidney specialist, Dr. Richard Johnson

Maybe, millions of years ago our primitive ancestors survived on the fruit of the trees, sweet with natural sugar and lots of fiber, which they loved to eat year round. Ice ages expanded and receded and our ancestors traveled. Times of feast and winters of famine followed. At some point a mutation occurred and made our ancestors wildly efficient processors of fructose. Even small amounts were stored as fat, a huge survival advantage when food was scarce. So powerful was this advantage that only the creatures who had the mutation survived.

When sugar hit the West in a big way, we had a big problem. Our world is flooded with fructose without all the fiber, but our bodies have evolved to get by on very, very little fructose.

Its a great irony: The very thing that saved us could kill us in the end.

## **Six non-nutritive sweeteners FDA approved for use in food & drinks**

Artificial sweeteners are not digested by the human body which is why they have no calories. But they pass through our gastrointestinal tract where they encounter vast amounts of bacteria which play a role on how we process sugars. In studies first on mice, and then tried with a group of seven adults given 10 to 12 packets of sweetener a day, four people triggered higher blood sugar levels. In a study using mice revealed their gut bacteria changed (some types more abundant, others shrank) after exposure to artificial sweeteners.

**aspartame** (NutraSweet, Equal) Blue packets, approved 1981, There is no clear link between the consumption of aspartame & development of brain tumors. Not for PKU.

**acesulfame- potassium** (Sunett, Sweet On), generally blended with other sweeteners.

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**Stevia Leaf Extract** (Truvia, PureVia) Green packets. Highly purified, but stevia plant, stevia leaf powder, and crude stevia extract is not allowed in food. May be sold as dietary supplements.

**Sucralose** (Splenda, Nevella) Yellow packets. Heat stable, found in baking blends.

## **Sugar Alcohols**

Sugar alcohols contain no alcohol. They are low-calorie sweeteners (about 2 calories per gram) whose names end in "ol" such as sorbitol, mannitol and glycerol. They are found in gum, candy and desserts. Sugar alcohols produce a smaller rise in blood glucose than other carbohydrates. But, they can have a laxative effect in some people, especially in children.



## Dr. Oz says

"Newer research says diet drinks and foods may mess with your brain and your metabolism. It turns out that artificial sweeteners flood your taste buds with sweet flavors but don't light up satisfaction centers in your brain the way real sweets do. So cravings build.

Artificial sweeteners also may ramp up your body's response to real sugars and carbohydrates - spiking levels of blood sugar. This is where the frightening news of their link to **metabolic syndrome**, prediabetes and diabetes comes from."

**Metabolic syndrome** is the condition where abnormal cholesterol levels, high blood pressure, high blood sugar and waistline obesity all happen like falling dominos. The syndrome increases risk for heart attacks and strokes.

### **In summary**     *(Teachers have fun reading this, emphasis the quotes)*

Sweet sugar knows your name, it calls to you from your cupboards, freezer and pantry. As you pass by the grocery shelves, sugary items whisper "Hey lady, come closer, have I got a sweet deal for you". You just tell those inviting bars, boxes, cans and colorful little sacks "If I come closer I'm going to turn you over and read your label. Yah- I've got your number - the number of calories in your grams of sugar. I know all the names you use to try and fool me, mister fancy packaging!"

You just keep smiling, knowing you are in control of what you choose to eat.

Information and quotes for this lesson taken from:

National Geographic magazine, "Sugar Why We Can't Resist It" August 2013,  
National Cancer Institute, artificial sweeteners and cancer  
Diabetes care and education, Academy of Nutrition  
American Diabetes Association  
Dr. Oz column "Some sour news about zero-calorie sweeteners"  
Parade magazine October 27, 2013  
AARP, Foods with hidden sugar quiz (which Anne had to double check and correct)  
Sugar 101, Putting Patients First  
Los Angeles Times, September 2014

Compiled, edited by Anne Engen  
2013 - 2014

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