

# Lesson Title: Sugar Lesson

## Brief Description

Explore the characteristics of sugar and artificial sweeteners.

**Duration of the lesson:** One day

## Learning Objectives

Students will be able to:

- Understand the similarities and differences between various sugars and artificial sweeteners
- Recognize factors to consider in selecting a type of sweetener
- Identify the kinds of sweeteners used in different types of food (beverages, baked goods, condiments, gum)
- Discuss the benefits and risks of eating sugar and sugar substitutes

## Standards

- Standard 3.1.1 and Standard 3.1.2

## Resources

Sugar and Artificial Sweeteners power point

Student Worksheet: Sugars and Artificial Sweeteners

Ziploc bag of individual sweetener packets including:

- Table Sugar
- Sugar in the Raw
- Honey
- Agave
- Equal
- Sweet N' Low

- Splenda,
- Stevia in the Raw
- XyloSweet

### **Additional resources:**

- “Fed Up” movie about sugar in processed foods, government policies that support use of sugar and high fructose corn syrup. 92 minutes. Narrated by newscaster Katie Couric, Producer Laurie David (Oscar winning producer of An Inconvenient Truth), Director Stephanie Soechtig. [http://en.wikipedia.org/wiki/Fed\\_Up\\_\(film\)](http://en.wikipedia.org/wiki/Fed_Up_(film))
- Let’s Take Back Your Health blog by Chris Kessler
  - Is All Sugar Created Equal <http://chriskresser.com/is-all-sugar-created-equal>
  - Does It Matter if a Sweetener is ‘Natural?’ <http://chriskresser.com/does-it-matter-if-a-sweetener-is-natural>
  - Is Refined Sugar Really Toxic? <http://chriskresser.com/is-refined-sugar-really-toxic>
  - The Unbiased Truth About Artificial Sweeteners <http://chriskresser.com/the-unbiased-truth-about-artificial-sweeteners>

### **Instructional Activities**

1. Hand out ziploc bags of sweetener packets to groups of two students
2. Choose several of these questions for students to answer. If students cannot find the needed information on the packet and don’t know enough about the sweetener to have an opinion, put the sweetener in the category, “insufficient information”:
  - a. Rank the sweeteners from least to most calories
  - b. Rank the sweeteners from least to most sweetness
  - c. Divide the sweeteners into 2 groups: Natural (made from plants and animals) and Artificial (a chemical manufactured in a laboratory)
  - d. Rank the sweeteners from least to most processed
  - e. Think about the health effects of different types of sweeteners:

## Nutrition Unit

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- i. Which sweeteners can be used by someone who has diabetes?
  - ii. Which sweeteners can be used by someone who is allergic to gluten?
  - iii. Which sweeteners can be used by someone who has PKU and cannot digest phenylalanine. (FYI, packages are required to carry a warning when a food contains phenylalanine)
  - iv. Which sweeteners might help someone lose weight?
  - v. Which sweetener should not be given to babies because it could cause botulism?
- f. Rank the packets from most to least number of ingredients
  - g. Rank the packets from most to least amount of information given. Is the information on the packets easy to understand? If not, identify a packet with information that is not easy to understand.
  - h. Which of the sweeteners are you familiar with? Which ones have you used?
  - i. Share results
3. Present power point
    - a. Now that students have more information, have them work in pairs to rank the packets in order, from the sweetener they would be most likely to use to the sweetener they would be least likely to use
4. Follow up with a class discussion:
    - a. Were you able to agree with your partner about ranking the sweeteners?
    - b. What's something about sweeteners you didn't know before this lesson?
    - c. Name some benefit of particular sweeteners
    - d. Name some risks of particular sweeteners
    - e. Of all the natural types of sugars, which one would be your preference and why?
    - f. Of the 3 artificial sweeteners, which one would be your preference and why?
    - g. Are you more likely to use natural or artificial sweeteners? Why?

- h. How would you select a sugar for someone with a specific goal, like weight loss? For a person with a health issue?

## **Accommodations**

Provide a taste-test station so students can see, touch and taste the various sweeteners. Provide the name of the main ingredient and a sample package to help students identify the product with the brand name.

## **Extensions**

1. Seek out a family member or friend who is restricting their use of sugar. Interview them to find out their concerns.
2. Interview the person who buys groceries for your family and ask them what kinds of sweeteners they buy, and why?
3. Go to the grocery store and identify 5 different types of food that contain sweeteners. Find products that contain 5 different sugars or artificial sweeteners. Create a grid with the product type, brand name, and type of sweetener it contains.

Name \_\_\_\_\_ Period \_\_\_\_\_ Date \_\_\_\_\_

## **Sugar and Artificial Sweeteners**

Rank the sweetener packets from least to most calories. List.

Rank the sweetener packets from sweet to sweetest. List.

Divide the sweeteners into 2 groups:

*Natural* (made from plants and animals) and *Artificial* (manufactured in a laboratory). List.

Rank the sweeteners from least to most processed. List.

Which sweetener contains the most ingredients? Name the sweetener & list the ingredients:

Name 4 reasons people may choose artificial sweetener over a natural sweetener.

- 1.
- 2.
- 3.
- 4.

Another Question: \_\_\_\_\_

Answer:

**Notes from Powerpoint:**

Sugar (sucrose)

\*table sugar

\*turbinado sugar

Honey

Agave

Xylitol (XyloSweet)

Stevia

Saccharin (Sweet N' Low)

Aspartame (Equal)

Sucralose (Splenda)

## More findings about artificial sweeteners

Using non-caloric artificial sweeteners do not seem to help people lose weight. Some studies suggest that people who use them actually gain weight.

Research studies on diet soda show:

- People who drink diet soda tend to gain more weight than people who don't.
- Children (age 9-19) who drank diet soda gained more weight than children who didn't drink diet soda. The more diet soda they drank, the more weight they gained.
- Use of artificial sweeteners may contribute to obesity and diabetes.
- People of normal weight who drink diet soda have a higher risk of diabetes, heart disease and stroke than those who don't drink diet soda.
- Eating a little sugar reduced the amount of food eaten at the next meal in people and in mice. Eating a little artificial sweetener did not change or increase the amount eaten at the next meal.
- The types of gut bacteria is different in people who use artificial sweeteners and those who don't. Mice that consumed artificial sweeteners had gut bacteria populations known to be associated with obesity and diabetes.
- A study that asked people to eat artificially sweetened foods for a week found changes in gut bacteria and signs of glucose intolerance. Glucose intolerance leads to metabolic syndrome and diabetes.
- Some gut bacteria found in people with glucose intolerance react to artificial sweeteners by causing inflammation. Inflammation also happens with sugar overdose. This causes changes in the body's ability to use sugar.

Why? Some hypotheses are:

- Sugar tastes sweet and satisfies hunger but eating no-calorie artificial sweetener only tastes sweet but does not satisfy hunger.
- Artificial sweeteners fill the craving for a sweet taste, but without the calories. The artificial sweetener teases the body into thinking it's real food, but since it doesn't have calories, the body doesn't feel full.
- Knowing you are drinking no-calorie soda makes you think you can eat more, and you overcompensate (diet soda with a piece of pie).
- The sweet taste of artificial sweeteners increases appetite. Regularly eating artificial sweeteners in diet soda and other foods may encourage sugar cravings and increase appetite.
- Artificial sweeteners don't satisfy the "Reward Center" in the brain, leading to craving sugar, eating more sweet, high-calorie food, and gaining weight.
- Eating artificial sweeteners may trick the body into expecting sugar and calories. The body may then release insulin. When the sugar doesn't come, the body may get confused and not metabolize sugar as well.
- Eating artificial sweeteners changes the microbiome - the bacteria in our intestines - and disrupts our body's ability to regulate blood sugar.

Experts recommend:

- Limit the amount of artificial sweetener you eat. Diet soda should be a treat, not an everyday thing, the same as candy.
- “Unsweetening” the world’s diet might be the key to reversing the obesity epidemic.
- Regulators should reassess the unsupervised consumption of large amounts of artificial sweeteners.

References/To Learn More

Blog: Diet soda may do more harm than good

[http://thechart.blogs.cnn.com/2013/07/10/diet-soda-may-do-more-harm-than-good/?hpt=hp\\_t2](http://thechart.blogs.cnn.com/2013/07/10/diet-soda-may-do-more-harm-than-good/?hpt=hp_t2)

Video: “Are Diet Sodas Dangerous to your Health?” Interview with Dr. Sanjay Gupta (4 min 19 sec)

<http://www.cnn.com/videos/health/2013/07/11/newday-intv-gupta-diet-soda-health.cnn>

Review article: Gain weight by “going diet”? Artificial sweeteners and the neurobiology of sugar cravings. Qing Yang. Neuroscience 2010.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2892765/>

Blog: Gut Bacteria, Artificial Sweeteners, and Glucose Intolerance

<http://www.weizmann-usa.org/media/2014/09/17/gut-bacteria-artificial-sweeteners-and-glucose-intolerance>