



Diabetes Life Lines

Sugar Science

What would happen if added sugars disappeared from our food landscape? Other than the more obvious effects, like candies and ice cream disappearing from grocery store shelves, how would things change? Would we be happy eating all of our yogurts, breads, and sauces without sugar?

It turns out that sugar is added to a variety of products for many reasons beyond sweetening. In fact, all kinds of foods from baked goods to a marinated steak might disappoint you if sugar wasn't used to make them. While too much is certainly a bad thing, just a gram or two of added sugar isn't the worst thing in the world, especially if it's making the taste and texture of healthy foods like cranberries and whole wheat bread more palatable.

How does it do that?

A Flavor Enhancer

Sugar isn't just for sweetness. When added to foods in small amounts, sugar can bring out other flavors. This is why it's sometimes added to cooked vegetables. It can also balance the acidity in fruit preserves and sauces, as well as bitterness in antioxidant-rich cranberries and chocolate. I'm sure everyone has had the disappointing experience of discovering that cocoa powder and chocolate are not the same thing.

Sweetness can also be a good thing, in some circumstances. For example, adding sugar to nutrition supplements or medicines makes it easier to take them. And as people age, they tend to lose taste and eat less because they don't enjoy food that they need to fuel their bodies.

as much. Adding some sugar to a meal can help older adults eat more of the foods that they need to fuel their bodies.

Color

There are two very important reactions that happen when sugar is cooked. The first is called caramelization. This happens when sugar is heated up and starts melting when it's not in contact with protein. Caramelization produces a dark brown color, as well as caramel taste. This reaction is used to color and flavor sauces, candies, and breads. It makes the experience of eating them more pleasurable.

The second reaction is called the Maillard reaction, which occurs when sugar and proteins are heated together. This is a very complicated reaction, and what happens depends on a lot of factors, like how long the food is cooked and at what temperature. You may have never heard of the Maillard reaction, but it's a big reason why you like so many of your favorite foods! It adds delicious flavors and aromas, along with a brown color. This reaction is responsible for the crusts on baked goods and meats as well as the distinct aroma of roasted coffee beans.

Texture

Sugar can also affect texture of a product. For example, in baked goods, sugar helps to tenderize by preventing proteins from stiffening up. In things like cakes, when sugar is beaten into the butter or shortening, it incorporates air. This helps with the fluffiness of the cake when it bakes.

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Ice cream needs sugar for texture as well as sweetness. The sugar keeps water thinly dispersed in the cream, so the ice crystals that form stay very small. If sugar is not used, large crystals form. Instead of being creamy, the ice cream would be extremely hard and un-scoopable. It would melt before you would be able to get a spoon into it!

Sugar is also an important ingredient in marinades. Sugar is very good at both bringing out the flavor in your marinade and tenderizing the meat itself.

Finally, sugar is essential in jams and jellies. Sugar allows the pectin starch in the fruit to gelatinize, so that a jam can actually form.

Preservation

Sugar is a water-loving compound. It likes to hog all the water in a food product. When sugar uses the water in a food, it means there is less water available for bacteria to thrive and spoil your food. That's another important role sugar has in jams and preserves. In baked goods, sugar also keeps all the water in the product to prevent it from drying out and becoming stale.

Fermentation

Fermentation is a process that microorganisms use to digest glucose when oxygen is not available. This process has been used in food production for thousands of years. It's involved in the making of many products, like yogurt, vinegar, beer, bread, cheese, soy sauce, and sauerkraut.

There are two main types of fermentation in common American food and drink. The first, lactic acid fermentation, involves bacteria that make lactic acid using the sugars in common foods like vegetables and milk. This process affects smell, flavor, viscosity (how thick the

product is), and mouthfeel (the sensation in your mouth). This is used to produce sauerkraut, yogurt and several other foods.

The second type is yeast fermentation. Yeast is a microorganism that acts as a leavening agent in some baked goods. That means that the yeast produces air that makes the product rise. Without yeast fermentation, we wouldn't have sourdough or other loaves of hearty yeast bread. Yeast need sugar – this is how they grow and multiply to the numbers needed to leaven the bread.

A Life without Sugar...

A life without sugar would be pretty bland. Many sauces wouldn't taste the same, there would be no jam to put on toast, and the bread that toast was made out of would be a dense chunk because the yeast couldn't make it rise. So, yes, too much added sugar is not good for you, and you should be looking to limit added sugar. However, don't think that you have to cut it out completely. If your food doesn't taste or feel good, you might lose the joy of the eating experience. And that would be a terrible thing!



Image from Pixabay: <https://pixabay.com/photos/muffin-cake-coffee-coffee-beans-1692335/>



Sugar Substitutes: An Update

Many people like to use low- and no-calorie sweeteners to help take care of a sweet tooth while cutting back on sugar. Using these sweeteners can be a helpful tool on the road to healthier eating. But some people still worry about eating too much of these sweeteners. There are also a few new ones out on the market. Here's a short update on what you should know about low- and no-calorie sweeteners or sugar substitutes.

Let's review what low and no calorie (nonnutritive) sweeteners are. Two main types are sugar alcohols and non-nutritive sweeteners. Whether we call them "natural" or "artificial" sweeteners really just depends on how they are made. Many of these sugar substitutes, even many of the artificial ones, are made from natural sources like fruits, vegetables, and regular sugar. So don't worry too much about whether they are called natural or artificial.

Sugar alcohols are low-calorie¹. They are carbohydrates, like sugar, but have less calories. They have 0 to 2 calories per gram instead of 4 calories per gram. They can come from fruits and vegetables as well as be made artificially. Names to look for on your nutrition label include sorbitol, xylitol, erythritol, and mannitol. When people eat a lot of these (more than 10 grams per day), they can get gas, stomach pain, and diarrhea. Sometimes people can be sensitive to this type of sweetener and get these symptoms when eating a normal amount.¹

Non-nutritive or no calorie sweeteners can also be made from plants or from sugar itself. These have few or no calories because your body can't break them down. They also are much sweeter than sugar, so they're used in very small amounts. There are now 8 FDA-approved non-nutritive sweeteners. You can read more about them in Figure 1². You can tell if these sweeteners are in your food by looking for these names on the ingredient list of the food label.

Figure 1

Non-nutritive Sweetener	Brand Names	Common Uses	Notes
Aspartame	Equal®, NutraSweet®	Tabletop sweetener; common in cereals, drinks, desserts, candy	People with PKU should avoid this sweetener.
Acesulfame potassium	Sunett®, Sweet One®	Sugar-free sodas	Mostly used alongside other non-nutritive sweeteners
Neotame	None yet	Not yet commonly used	7,000 times sweeter than sugar!
Saccharin	Sweet 'N Low®, Sweet Twin®, Sugar Twin®	Low-calorie food and drink products	We've been using this sweetener since the 1800s!
Sucralose	Splenda®, Equal Sucralose	Tabletop sweetener; in desserts, canned fruit, beverages, and syrups; can be used as a sugar replacement in cooking or baking	Very versatile.
Stevia	Truvia®, Stevia in the Raw®, SweetLeaf®, Sweet Drops™, Sun Crystals®, PureVia®	Tabletop sweetener; used in beverages	It can taste a little bitter, so it's often used with other sweeteners.
Luo ha guo	Monk Fruit in the Raw®	Not yet commonly used	It's extract from monk fruit, and it's been used in China for almost 1,000 years!
Advantame	None yet	Not yet commonly used	This is the newest artificial sweetener. It's 20,000 times sweeter than sugar!

Adapted from the Cleveland Clinic:

<https://my.clevelandclinic.org/health/articles/15166-diabetes-sugar-substitutes--nonnutritive-sweeteners>



Although the grams of added sugars will be listed on all nutrition facts labels by next January, no-calorie sweeteners do not have to be listed. Manufacturers can choose to list the amount of low-calorie sweetener in grams.^{1, 3} The only reason it would have to be included is if the label makes a health claim about sugar or sugar alcohols.³

Low and no calorie sweeteners are still being studied. Researchers say they are safe, but many people feel more studies are needed.

Researchers have not yet figured out if artificial sweeteners affect body weight in children and adults⁴. Some studies show using them is helpful, and others show that using them may actually be related to being overweight. The American Academy of Pediatrics said that using artificial sweeteners might mess up kids' awareness of how much they're eating⁵. This might lead to overeating. The American Medical Association said that artificial sweeteners might make people prefer very sweet foods⁶. This might make naturally-sweetened foods seem less appealing. They also said that because they have few-to-no calories, they might change feelings of hunger and fullness. And, drinks with artificial sweeteners often contain caffeine. This could be concerning if kids start drinking too much of them. However, other studies show that replacing drinks with sugar with drinks made with artificial sweeteners can help adults lose weight.

The American Heart Association reviewed many large studies last year⁷. They found that people who drank artificially-sweetened beverages for a long time had more vascular events, mainly stroke. This was if they drank one beverage per day compared to none at all.

However, people who use artificial sweeteners were more likely to have diabetes or be obese.

These are important heart disease and stroke risk factors. It's hard to know if one caused the other. Is the sweetener the chicken, or the egg?

Overall, professionals don't want us to stop using artificial sweeteners. The Cleveland Clinic says that using them might help with blood sugar control and tooth decay². But, foods with non-nutritive sweeteners might take the place of more nutritious foods. A cookie is still a cookie, even with sucralose instead of sugar. The American Heart Association recommends using artificial sweeteners as a tool to switch over to a diet lower in sugar. Concentrate on getting a diet of the healthy foods you need and use low and no calorie sweeteners to help you get there.

If you're interested in other ways to cut down on sugar, the American Heart Association has great online resources. Visit www.heart.org/en/healthy-living/healthy-eating/eat-smart for more information.



Image: Pixabay <https://pixabay.com/photos/icing-sugar-sweet-pastries-3744757/>

References:

1. US Food and Drug Administration. Sugar alcohols fact sheet. 2014. Available from: https://www.accessdata.fda.gov/scripts/InteractiveNutritionFactsLabel/factsheets/Sugar_Alcohols.pdf
2. Cleveland Clinic. 2019. Sugar substitutes & non-nutritive sweeteners. Available from: <https://my.clevelandclinic.org/health/articles/15166-diabetes-sugar-substitutes--nonnutritive-sweeteners>



3. US Food and Drug Administration. Nutrition labeling summary sheets. 2014. Available from: <https://www.fda.gov/inspections-compliance-enforcement-and-criminal-investigations/inspection-guides/nutrition-labeling-summary-sheets>
4. Dietary Guidelines Advisement Committee. Scientific report of the 2015 Dietary Guidelines Advisory Committee: advisory report to the Secretary of Health and Human Services and the Secretary of Agriculture. Available from: <https://health.gov/dietaryguidelines/2015-scientific-report/>
5. Committee on Nutrition. 2015. The role of the pediatrician in primary prevention of obesity. *Pediatrics*. Doi: 10.1542/peds.2015-1558.
6. American Medical Association. 2012. Report 5 of the Council on Science and Public Health (A-12): Taxes on beverages with added sweeteners. Available from: https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/public/hod/a12-csaph-reports_0.pdf
7. American Heart Association Nutrition Committee. 2018. Low-calorie sweetened beverages and cardiometabolic health. Available from: <https://www.ahajournals.org/doi/pdf/10.1161/CIR.0000000000000569>
8. American Heart Association. 2018. Tips for cutting down on sugar. Available from: <https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/sugar/tips-for-cutting-down-on-sugar>

Sugar: How Much is Too Much?

You might have heard some pretty strong talk about sugar. How much is too much? Is it really in everything? Are there any recommendations specifically for people with diabetes? It can get pretty confusing! So, what do the experts say?

To your body, all sugar is the same, but how you get it is very important. When people talk about sugar, they're typically talking about added sugar and not natural sugar. Added sugar is pretty much exactly what it sounds like. It's sugar that has been added to food products to make them sweeter or improve their texture. On the other hand, natural sugar is the sugar that is naturally found in things like fruits, vegetables, and milk. A lot of the time, you can find added sugars on a food label's ingredient list as "sucrose," "molasses," "honey," or different types of syrups, like high fructose corn syrup.

Most health professionals agree that eating too much added sugar is not healthy.

Natural sugars give you energy along with all the vitamins, minerals, and fiber found in whole foods. But, in some products with added sugar, the amount they use is too much. And because added sugar is just sugar, it's just empty calories. For example, say you had the choice between eating a whole orange and drinking orange soda. Going with the apple would give you a lot more vitamins, minerals, and fiber and keep you fuller for longer than if you chose the soda.



Image from Pixabay: <https://pixabay.com/photos/ice-cream-cone-melting-hot-1274894/>

So far, there is not a separate limit on added sugar for people with diabetes, so you can follow the recommendations in the Dietary Guidelines for Americans. They say that it's best to keep our sugar intake at or below 10% of our daily calories. If you eat a 2,000-calorie diet, this means 200 calories of sugar. You could count that on food labels as 50 grams of sugar a day. It might be easier to understand as 10 teaspoons. This gives you enough room in your diet to enjoy a cookie every now and then, and eat healthy foods like yogurt and whole grain bread that have sugar added to improve their taste and texture. However, it keeps the amount low enough so there is plenty of room in your diet for other healthy foods.



The American Heart Association is stricter on added sugar. They say that eating a diet high in added sugar is associated with overeating, obesity, and heart disease, so we should aim for eating even less of it. They recommend that men eat no more than 9 teaspoons (36 grams, or 150 calories) and women no more than 6 teaspoons (25 grams, or 100 calories) per day from foods and drinks. This is no matter how many calories you eat per day.

Even with the disagreement on how much we should limit added sugar, both groups agree on two things. One, it adds calories without healthy nutrients like vitamins, minerals, and fiber. Two, the average American is eating too much of it.

According to the Dietary Guidelines, about 70% of us meet or exceed how much added sugar we should be eating. The average intake of added sugar is around 270 calories per day, or about 13% of our diet, but it's even higher for younger people.

Kids 2 to 19 years old get 16% of their calories from added sugar. Let's do some math: if a teen eats 2,000 calories per day, that means they eat 320 calories of added sugar from foods and drinks. That's the same as eating 20 teaspoons of table sugar! No parent would let their child do this, but the sugar in foods and drinks adds up quickly! Teenagers and children are going through important growth and development. If sugar takes up that much space in their diet, they might be missing out on healthy foods that give them what they need to grow.

Here are some sneaky sources of added sugar to watch out for:

- Condiments, like ketchup or salad dressing
- Specialty teas and coffees (some iced teas can have over 10 grams of added sugars!)
- Breakfast cereal
- Smoothies
- Non-dairy milks
- Protein bars

The takeaway? Whether you think the recommended added sugar intake should be strict or more relaxed, we know one thing for sure – we need to cut back!

References:

1. U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015 – 2020 Dietary Guidelines for Americans. 8th Edition. December 2015. Available from: <https://health.gov/dietaryguidelines/2015/guidelines/>.
2. American Heart Association. 2018. Added Sugars. Available from: <https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/sugar/added-sugars>
3. Centers for Disease Control and Prevention. 2019. Know your limit for added sugars. Available from: <https://www.cdc.gov/nutrition/data-statistics/know-your-limit-for-added-sugars.html>



Sautéed Cinnamon Apples

(Taken from <https://www.diabetesfoodhub.org/all-recipes.html>)

Serving size: ½ cup

Yield: 4 servings per recipe

Ingredients

- 1 tablespoon margarine
- 2 Granny Smith apples, large
- 3 tablespoons water
- ½ teaspoon ground cinnamon
- 1 teaspoon vanilla extract
- 1 tablespoon honey (optional)

**Directions**

1. Peel and slice apples.
2. Melt margarine in a sauté pan over medium-high heat.
3. Add apples, and sauté for 3 minutes, stirring frequently.
4. Add water, cinnamon, vanilla, and honey (if desired). Reduce heat to low and simmer for 12 minutes, stirring occasionally.

Nutrition Facts per Serving

Calories: 80

Carbohydrates: 14 grams

Total fat: 2.5 grams

Protein: 0 grams

Sodium: 25 milligrams

Fiber: 2 grams

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Diabetes Life Lines is a bi-monthly publication sent to you by your local county Extension agent.

It is written by an Extension Nutrition and Health Specialist and other health professionals from the University of Georgia. This newsletter brings you the latest information on diabetes self-management, healthy recipes and news about important diabetes-related events.

If you would like more information, please contact your local county Extension Office.

Yours truly,

County Extension Agent

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