

*Webinar 5 Handout:*  
**GUIDE TO ARTIFICIAL SWEETENERS  
& SUGAR SUBSTITUTES**

Before we get into the nitty gritty about artificial sweeteners, I want to point out that this is a controversial topic and there are many dietitians out there that might disagree with my point of view. Like any responsible health professional, I've kept up with the research and even adapted my opinion over the years as we discover new information about the effects sweeteners have on human health. Below represents my view on sweeteners based off of the current available research.

Artificial sweeteners and sugar substitutes are a seemingly appealing option for those looking to watch their weight or manage diabetes. They are often referred to as non-nutritive sweeteners because they provide an extra sweet taste while adding no (or very few) calories to your diet. But just because there are no calories, that doesn't mean there aren't any risks. Research has linked these processed sweeteners to an increased risk of type 2 diabetes, increased caloric intake throughout the day and other negative effects that we'll talk about below.

Artificial sweeteners are just that, artificial. They are chemically concocted products that provide zero calories and zero actual glucose, and can be up to 700 times sweeter than sugar. There are also sugar substitutes that are slightly more natural. They can be derived from sugar and chemically altered to provide varying caloric amounts and a less absorbable form of glucose. There are also sugar substitutes that are derived from plants in nature. Some might think that sugar substitutes are better for you because they are at least partially real sugar or somewhat natural, but there is plenty of research to suggest this isn't always the case.

Most of these "fake" sugars have large potential for negative health outcomes and there is plenty of research supporting my position to stay away. Even if you're convinced artificial sweeteners have no place on your plate, it can be tricky to eliminate these pesky processed sweeteners from your diet because they can be hidden in many foods. The following will provide some guidance as to why artificial sweeteners and sugar substitutes are a big "no-no", what specific sweeteners to watch out for and some common (and not so common) products they are found in. (Hint: diet soda is a big offender in this category). When it comes to artificial sweeteners and sugar substitutes, the risks simply outweigh the benefits.

## **Health Issues Associated with Artificial Sweeteners & Sugar Substitutes**

**They distort your natural sense of taste.** They are manufactured to be up to 700 times sweeter than pure sugar, so after regular consumption of these products, it becomes hard to detect sweetness from other natural foods. After too much sweetener you lose your appreciation for the true taste of real foods and you start to depend on artificial sweeteners for taste (we all know clients who carry packs of sweetener in their purses).

**They cause cravings for more sugar.** When you eat foods that taste sweet, the body expects calories to follow that hit of sweetness. When you don't get those calories, you end up with sugar cravings later in the day.

**They don't allow your body to "count" calories properly.** These sweeteners disturb the body's ability to "count" or recognize calories. They can disrupt your hormones and ultimately lead to a domino effect that increases desire for sugar and weight gain. With weight gain comes the risk of obesity along with other co-morbidities like diabetes and cardiovascular disease.

**They can damage the beneficial microflora in the gut.** They change the microflora and pH balance in the gut. By altering the natural ecosystem of the stomach and intestines, they put cells at increased risk of infiltration by harmful bacteria which increases risk of infection.

**Consuming excess of these products can lead to hypoglycemia in those with type 2 diabetes (a target population for these products to be marketed to).** Hypoglycemia is low blood sugar. Usually when you eat something sweet it triggers the release of insulin in your body. Insulin allows you to absorb glucose into your cells. When you eat something artificially sweetened, your body still triggers the release of insulin but there is no glucose available because the artificial sweetener has no glucose in it. So, the insulin gathers any glucose from the blood that it can, and causes your blood sugar to drop (because it's all being absorbed into your cells). Low blood sugar not only causes shakiness, dizziness, sweating and headaches but it can also be dangerous, even life-threatening. If your blood sugar drops too low, you can lose consciousness altogether. The way to play it safe is eating small amounts of the real deal (sugar), and don't try to trick your body.

**Sugar alcohols in particular can have negative effects on the gastrointestinal system.** They're considered low-digestible carbohydrates (LDCs) because they are either partially absorbed in the small intestine or not absorbed at all but are at least partly fermented by bacteria in the large intestine. For this reason they can cause some unpleasant symptoms. Large intakes of erythritol have

been linked to diarrhea, nausea and borborygmus (aka stomach rumbling from gas), xylitol has been shown to cause cramps, and sorbitol can have laxative effects and lead to diarrhea - it's even approved by the FDA as a laxative.

## **Products with Artificial Sweeteners & Sugar Substitutes**

Aside from single serving packs of alternative sweeteners you can find in your local coffee shop (with brand names like *Sweet 'n Low*, *Splenda*, *Equal*, etc.) all of the sugar substitutes listed below, including artificial sweeteners, are used in foods and beverages marketed as “sugar-free” or “diet”. If a product tastes super sweet but is fairly low in sugar on the nutrition panel, there is a good chance there are artificial sweeteners hidden in the ingredients list. Some sugar substitutes even have thickening and binding properties, so they are used as additives in products that aren't even considered sweet. You can find these sweeteners in thousands of products, and that number continues to grow. Aspartame alone is found in over 6,000 products. Artificial sweeteners and sugar substitutes are used in (but not limited to):

- Baked goods
- Breads
- Candy
- Cereals
- Chewing gum
- Condiments
- Cough drops
- Energy bars
- Flavored waters and other beverages
- Fruit juices
- Ice cream
- Jelly
- Meat and poultry products
- Nutritional/multivitamin supplements
- Soda (diet and regular)
- Sports drinks
- Toothpaste
- Yogurt

## **Types of Artificial Sweeteners & Sugar Substitutes**

There are so many different types of artificial sweeteners on the shelves these days, it can be tough to keep them all straight. Here is a quick outline so you know what is classified as what. Then we'll go through the details on each.

### **Most Common Artificial Sweeteners**

- Aspartame
- Sucralose
- Acesulfame potassium (Ace-K)
- Saccharin

### **Sugar Alcohols**

- Erythritol
- Sorbitol
- Xylitol

### **Natural Sugar Substitutes**

- Stevia
  - Green Leaf Stevia (whole leaf)
  - Stevia Leaf Extracts
  - Processed Stevia
    - Truvia
    - SweetLeaf
    - PureVia
    - Stevia in the Raw
- Monk Fruit

### **Novel Sweeteners**

- Tagatose
- Trehalose
- Fructo-oligosaccharide

**Aspartame** is the most common artificial sweetener and is 200 times sweeter than table sugar. It is marketed as Equal or NutraSweet (the blue packets).

*Products: Diet Coke, Diet Pepsi, Diet Dr. Pepper, Diet Snapple Iced Tea*

**Sucralose** is 600 times sweeter than sugar and is marketed as Splenda (the yellow packets) and Equal Sucralose.

*Products: Ocean Spray Light, Flavored Propel Fitness Water, Diet V8 Splash, Yoplait Light, Yoplait Greek 100, Dannon Light & Fit, Breyer's No Sugar Added, Smucker's Sugar Free, Heinz Reduced Sugar Ketchup*

**Acesulfame potassium** also known as Ace-K, is 200 times sweeter than sugar and is marketed as Sweet One. It is found in many products in combination with aspartame or sucralose (including some of those listed above).

*Products: Powerade Zero, Gatorade G2, Coke Zero, Sprite Zero, yogurt*

**Saccharin** was the first artificial sweetener to ever be made. It is 300 to 500 times sweeter than sugar and is marketed as Sweet'N Low (the pink packets), Sweet Twin, Necta Sweet, and Equal Saccharin. It's less abundant in processed foods than other artificial sweeteners but some products still have it.

*Products: Toothpastes, baked goods, fountain sodas and low carb bars*

**Sugar alcohols (polyols)** are naturally occurring compounds found in plant foods like fruits and vegetables but they can also be commercially produced from other forms of sugar. They are typically a little less sweet than table sugar and contain fewer calories because they aren't converted to glucose as quickly and thus aren't fully absorbed by the body. These "mock" sugars can cause stomach upset (GI distress) similar to the artificial sweeteners listed above. However sugar alcohols and artificial sweeteners are not one and the same. Sugar alcohols are derived from sugar, contain some calories, and have a different chemical structure from sugar that alters the way the body metabolizes them. Remember, artificial sweeteners are chemically produced compounds (not derived from sugar) that contain zero calories. Sugar alcohols are often deemed the lesser of two evils, however with unknown long-term effects I recommend steering clear as much as possible. Look out for ingredients that end in "-ol" (this suffix denotes the ingredient is a sugar alcohol).

**Erythritol** is 70% the sweetness of sugar and gives 20% of the calories per gram compared to table sugar. It is manufactured from cornstarch and is used mainly in confectionery and baked goods, chewing gum and some beverages. It's the least offensive option as far as GI distress goes.

*Products: Halo Top ice cream, Enlightened ice cream, Elli Quark, Bai Beverages, Starbucks Refreshers*

**Sorbitol** is about half as sweet as table sugar and has about half the calories. It is commercially made from dextrose (glucose) produced from corn starch.

*Products: Most toothpastes contain this according to NIH, sugar free gum and candies*

**Xylitol** is about as sweet as table sugar, is absorbed slowly and only partially utilized so it has just over half the calories. It is a sugar alcohol found naturally in woody fibrous plant materials like corn cobs or hardwood.

*Products: Nasal sprays, gums and candies*

**Natural sugar substitutes** are sweeteners that come from natural sources and are typically thought to be minimally processed. However, there are a couple of known “natural” sweeteners that are highly refined forms of their natural sources, including some stevia products like truvia. These types of natural sweeteners are mixed with sugar alcohols (listed above) and/or other fillers. Research on the negative effects of these products are mixed but in general, . it is best to avoid any highly processed sweetener. However, there are a few natural sugar substitutes that get a green light from me if used in small amounts. Here’s the scoop on how to navigate the sweetener aisle:

**Stevia** is about 200-350 times sweeter than table sugar and has no calories. It is made from the Stevia rebaudiana plant of South America. There are two compounds in the plant that give stevia its sweet taste: stevioside and rebaudioside. Whole leaf stevia products contain both sweet compounds (note that this does not have FDA GRAS status), while most processed forms of stevia just contain rebaudioside (Reb A) or a combination of Reb A and fillers. Even though a couple studies (using extremely high doses) have linked stevia to changes in DNA, studies didn’t show an increased risk of cancer, fertility problems or offspring with disabilities. On the flip side, studies have shown that stevioside may lower blood pressure in people with elevated blood pressure. Note: large doses were used during these studies. Other studies have linked stevia to a reduction in blood sugar and potential glycemic control in people with diabetes. Other studies have shown stevia’s possible anti-inflammatory benefits. If you can control the very small amount of refined sugar in your diet you may be fine with keeping it in. For others, stevia is an alternative, but the less processed forms are recommended. Below we will discuss the different forms of stevia and the brand names to look for.

*Products that contain forms of stevia: Trop50 orange juice, Honest Fizz, Coca Cola Life, Dannon Oikos Triple Zero Yogurt, Chobani Simply 100*

**Green Leaf Stevia** is the least processed form and is made from the whole stevia leaf, containing both stevioside and rebaudioside compounds. The leaves can be dried and ground into powder

form. Though used in other countries, whole stevia leaves are not classified as GRAS by FDA and due to the presence of the stevioside compound, they have a slightly bitter aftertaste.

**Stevia Leaf Extracts** are products made with an extraction of the stevia compound rebaudioside, sometimes seen as Reb A on labels (Reb A has been granted GRAS status). Extract is available in powder form or liquid form by blending concentrated stevia extract in a base of purified water.

**Processed Stevia** is just that: processed, sometimes highly processed. They contain the sweet rebaudioside compounds from the stevia leaf as well as other fillers. Truvia, SweetLeaf, PureVia and Stevia in the Raw are a few brands on the shelf.

**Truvia** is one of the most popular brands and is brand mix of stevia leaf extract (just the rebaudioside compound), erythritol and natural flavors. Truvia relies on stevia to provide most of the sweetness while erythritol is used as a bulking agent to give it a crystalline form so that it resembles table sugar. The majority of the product is erythritol; stevia is just 1% since it's sweetness is so potent. You usually won't see the brand name Truvia on an ingredients list, but many products use a combination of stevia and erythritol.

**SweetLeaf** is a combination of stevia, silica, and inulin.

**PureVia** is made from dextrose, stevia powder, Reb A, and natural flavors.

**Stevia in the Raw** is made from dextrose and stevia leaf extract.

**Monk Fruit** is 150 to 200 times sweeter than table sugar with zero calories. It is a type of small melon found in Southeast Asia. You can find monk fruit in sweeteners like Monk Fruit in the Raw. It's also used in many processed foods, sometimes in combination with other sweeteners. If choosing monk fruit, try to find pure sources without other things added.

*Products: Vitalicious products (VitaCakes), Kashi products (powders), Bear Naked products, So Delicious products, Pure Nutrition Whey Isolate Protein, Emergen-C supplements, Dole Fruit Cups, Hubert's Diet Lemonade, Arctic Zero, Chobani Simply 100*

**Novel sweeteners** are sweetening materials not previously known or used in the food supply. They are often combinations of various types of sweeteners, are less commonly known, and are mostly advertised as natural sweeteners. (Stevia and Truvia are both natural and were once novel



sweeteners). Eating novel sweeteners in excess is known to cause flatulence, bloating, stomach cramps, and diarrhea.

**Tagatose** is about 90% as sweet as sugar and provides  $\frac{1}{3}$  of the calories compared to fructose. It is a synthetic additive similar to fructose that occurs naturally but is also manufactured from lactose in dairy products. It can be found under brand names such as Nutrilatose and NuNatural's PreSweets. Foods containing tagatose can't be labeled as "sugar-free." It's not very common in packaged foods.

**Trehalose** is half as sweet as sugar and has 4 calories per gram (that's the same as sugar). It is manufactured commercially from cornstarch, but is also naturally found in foods such as honey, mushrooms, shrimp and lobster. It is marketed under the Cargill company's brand Treha. It's not common in packaged foods and isn't actually used for its sweetening abilities. If you see it in food or cosmetic products it is likely there as a preservative.

**Fructo-oligosaccharide** (FOS) is about 30-50% as sweet as sugar. It is a class of non-digestible, low-calorie ingredients that are manufactured by fragmenting a large molecule called inulin. Inulin is a polysaccharide that occurs naturally in chicory, Jerusalem artichokes, wheat, onions, and bananas. On top of being used in sweet applications, it has also been approved for use as a binder and stabilizer in a variety of meat and poultry products. It is known to be a Steviva brand product but otherwise is commonly sold under its own name.

I encourage you to present the information about these sweeteners to your clients objectively. It is OK to say that the science isn't conclusive on all of them yet. Help your clients determine if the "innocent until proven guilty" approach to consuming artificial sweeteners is the direction they want to take after giving it critical thought. Both personally and professionally I believe there is not room in a healthful diet for artificial anything, and most sweeteners in excess are damaging to health and make weight management even harder. Help your clients learn to appreciate the natural taste of real foods without relying on sweeteners for flavor. Once they are weaned off sweeteners they will learn to love the tart taste of yogurt, the bitter taste of coffee, and the refreshing taste of plain old water or tea. That said, not all clients will have any easy time removing sweetness from their diets. For just a little added sweetness, my preferences are pure honey, maple syrup and coconut sugar in very small amounts. For clients who might struggle with controlling intake of caloric sugars, the most natural sugar substitutes including monk fruit and pure stevia extracts are a better choice than any artificial or overly processed sweetener.