*Barbara Davis Center for Childhood Diabetes*

# What's The Scoop on Sweeteners?

*— Gail Spiegel MS RD CDE*

The following is an update on the sweeteners that are currently approved by the Food and Drug Administration (FDA) and available on the market. The Barbara Davis Center does not endorse or condemn any certain product.

Sweeteners can be divided into two groups based on the calories they provide. These two groups are nutritive (contain calories) and non-nutritive sweeteners (do not contain calories).

## NUTRITIVE SWEETENERS

Nutritive sweeteners provide calories and carbohydrates and include two types of sweeteners that are commonly used: sugars and sugar alcohols.

### SUGARS

Sugar sweeteners include sucrose (table sugar), fructose, honey, high fructose corn syrup and maple syrup as well as others. Sucrose and fructose are the primary sugar sweeteners that occur naturally in the food supply or are added as sugars in corn sweeteners and syrups. Sugar sweeteners provide 16 calories and 4 grams of carbohydrate per teaspoon.

Agave nectar is a syrup that is refined from a cactus-like plant and is 140 – 160 times sweeter than sugar. One teaspoon provides 20 calories and 5 grams of carbohydrate.

### SUGAR ALCOHOLS

Sugar alcohols include sorbitol, mannitol, xylitol, erythritol, isomalt and hydrogenated starch hydrolysates as well as others. Most sugar alcohols provide approximately 8 calories and 2 grams of carbohydrates per teaspoon. Sugar alcohols are absorbed more slowly than sugar and eating an excessive amount can cause diarrhea. Erythritol is found in a sweetener named Swerve. Sugar alcohols are found in such products as sugar free candies, chewing gum, and baked goods such as cookies. Despite being labeled "sugar-free" these products still contain carbohydrates and will cause a rise in blood sugars. Erythritol is much lower in calories and carbohydrates than the others and may not cause a rise in blood sugars. Be sure to check the nutrition facts on the label to determine total carbohydrate content.

## NON-NUTRITIVE SWEETENERS

Non-nutritive sweeteners do not provide any calories or carbohydrates. There are currently six non-nutritive, artificial sweeteners approved by the FDA. They are saccharin, sucralose, aspartame, acesulfame-K, neotame and advantame. In addition, Stevia and Luo Han Guo, both natural sweeteners do not provide calories or carbohydrates.

### SACCHARIN

Saccharin is 300 times sweeter than sugar. It provides no calories or carbohydrates and is not metabolized by our bodies. It is approved for use in 100 countries, but has been controversial here in the United States. Questions about saccharin's safety first began in 1977 when studies suggested it caused bladder tumors in rats. Saccharin used to carry a warning on the label, but in 2000 the National Institutes of Health removed saccharin from the list of carcinogens and Congress removed the requirement for warning notices. Studies of high users do not support an association between saccharin and cancer. Saccharin can be found in Sweet'N Low®, Sugar Twin® and other tabletop sweeteners as well as fountain drinks. The amount of saccharin in each product is limited

### SUCRALOSE

Sucralose was approved by the FDA in April 1998 for use as a tabletop sweetener and in desserts, candies and nonalcoholic beverages. Sucralose is 600 times sweeter than sugar and provides no calories or carbohydrates. It is made from sucrose, but is altered so that it is much sweeter than sugar and is not absorbed by the body. It does not break down when heated and can be used for cooking and baking. Sucralose can currently be found in many diet or sugar free drinks, sugar free ice cream and other products. It is marketed under the trade names Splenda® and Nevella®. Nevella® is sold in regular and probiotic versions.

### ASPARTAME

Aspartame is 200 times sweeter than sugar. Aspartame is broken down into aspartic acid, methanol, and phenylalanine by the digestive process. The amino acids phenylalanine and aspartic acid are metabolized to provide four calories per gram. Because this sweetener is very intense and we use it in such small amounts, it provides no calories. Aspartame has been approved by the FDA since 1981. It has been deemed safe by major health groups and agencies in over 90 countries, including the World Health Organization and the American Medical Association. It is currently approved for use as a general-purpose sweetener in all foods and beverages. It breaks down when heated and does not work well in cooking and baking. This sweetener is in many products. Some commonly used products that contain aspartame are as follows: Equal®, NutraSweet®, NatraTaste™, diet sodas, sugar-free JELL-O®, light yogurts, powdered soft drinks, sugar-free ice cream.

Aspartame has caused the most controversy and appears to receive more media attention about its safety than any other sweetener. Studies have not found any link between aspartame and diseases like Alzheimer's or multiple sclerosis. Research has not found that aspartame leads to an increased risk of cancer either. The only negative effects that aspartame has been shown to cause in a few small research studies is worsening migraines for some patients.

## ACESULFAME-K (ACE-K)

Ace-K is also 200 times sweeter than sugar. This sweetener is not metabolized by the body either and therefore provides no calories or carbohydrates. It has been approved by the FDA since 1988. It is approved for use as a general-purpose sweetener and is used in more than 80 countries. Ace-K does not break down when heated and can be used in cooking and baking. It is currently used in sugar- free ice creams and many sugar-free or diet beverages, often times in combination with sucralose or aspartame. Ace-K goes by the trade names Sunett® and Sweet One®.

## NEOTAME

This sweetener was approved by the FDA as a general purpose sweetener in 2002. Neotame is very intense, 40 times sweeter than aspartame and 7,000-13,000 times sweeter than sugar. It can be used in baking and cooking. As of the writing of this review, neotame was not found in any products on the market..

## STEVIA

This is a natural sweetener from the stevia rebaudiana plant found in South America and is 250 times sweeter than sugar. Stevia contains no calories or carbohydrates and does not affect blood glucose. Stevia as the whole leaf has been sold in the US as a dietary supplement for many years, but in 2008, the FDA recognized a part of the stevia plant, known as Rebiana or Reb A, as safe for use in food products. You can buy stevia in granular and liquid forms from grocery and health food stores for use in drinks, cooking and baking. Brand names for stevia include Truvia™ and PureVia™. Truvia™ also contains erythritol and has 2 grams of carbohydrates per packet, but the carbohydrates are not digested or absorbed by the body according to the company so they do not affect blood sugar. Purevia™ contains <1 gram of total carbohydrate per packet.

## LUO HAN GUO (Monk Fruit Extract)

This sweetener is commonly known and marketed as monk fruit extract and has been approved by the FDA as generally recognized as safe since 2009. Monk fruit is grown predominantly in the southern mountains of the Guangxi Province, Southern China. It is a perennial vine in the cucumber or melon family. Monk fruit extract is 150 to 300 times sweeter than sucrose. It is heat stable and it's intended use is as a tabletop sweetener, a food ingredient, and a component of other sweetener blends.

## ADVANTAME

Advantame is 20,000 times sweeter than sugar. It was approved by the FDA as a general purpose sweetener and flavor enhancer in 2014. It can be used in baking and cooking. As of this writing advantame was not found in any products on the market.

Today, there are more alternatives than ever for people with diabetes. Food manufacturers are using new sweeteners and combining sweeteners to improve the taste and mouthfeel of sugar-free and low-sugar foods and beverages. Plus, sucrose is no longer restricted from the diet and can be included within the context of a healthy diet. For those who count carbohydrates, foods containing sugar can be substituted for other carbohydrates in the meal plan or extra insulin can be given. When it comes to sweeteners, each family needs to decide what works best for them.

# WHAT'S CONSIDERED SAFE?

| Sugar Substitute | Acceptable Daily Intake (ADI)* | Product Equilvalents+ |
|---|---|---|
| Luo Han Guo (Monk Fruit Extract) | No ADI determined*** | No Equivalent |
| Saccharin | 15 mg/kg** body weight | No Equivalent |
| Acesulfame-K (ACE-K) | 15 mg/kg** body weight | 8 packets of Sweet One |
| Aspartame | 50 mg/kg of body weight | 33 packets of Equal or 5 cans of diet soda |
| Advantame | 32.8 mg/kg body weight | No Equivalent |
| Sucralose | 5 mg/kg of body weight | 9 packets of Splenda |
| Neotame | 0.3 mg/kg of body weight | No product equivalent as it is rarely used in foods |
| Stevia | 4 mg/kg of body weight | 29 packets or eight 8-oz rebiana-sweetened beverages |

*Acceptable Daily Intake (ADI) is defined as the amount at which there is no adverse effect and a reasonable certainty that no harm will come from use. It is an amount that you can consume for the rest of your life with no concern about safety. ADI is set by the FDA, the Joint Expert Committee of Food Additions of the United Nations Food and Agriculture Organization, and World Health Organization.

**1 kilogram (kg) = 2.2 lbs.

***When an ADI has not been determined this is usually because the Estimated Daily Intake (EDI) of this sweetener is well below the ADI for average or high users.

+For 23kg (50 lb.) child

**REFERENCES**

Position of the Academy of Nutrition and Dietetics: Use of Nutritive and Nonnutritive Sweeteners. Journal of the Academy of Nutrition and Dietetics 2012: 112: 739-757.