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ARTIFICIAL SWEETENERS VERSUS NATURAL SWEETENERS

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Abstract: *Carbohydrates are an important dietary nutrient which is mostly used to supply energy to the body, as well as a carbon source for synthesis of other needed chemicals. In addition, mono- and disaccharides are craved because of their sweetness. We present different types of sweeteners, which are the basic contents of foods which we consume every day and are demonstrated the positive and negative effects of natural and artificial sweeteners.*

Key words: *artificial, carbohydrates, natural, sweeteners.*

1. Introduction

Natural sweeteners exist or are produced by nature, without added chemicals or fancy machinery. The only sugars that are optimal to eat are wild, non-hybridized, seeded fruits, and the natural sugars and starches in living vegetables, trees, seeds, nuts, and roots. The following are considered natural sweeteners: maple syrup, honey, stevia, molasses, coconut sugar, date sugar, agave nectar and xylitol [4].

Artificial sweeteners, which are also called sugar substitutes, alternative sweeteners, or non-sugar sweeteners, are substances used to replace sugar in foods and beverages. They can be divided into two large groups: nutritive sweeteners, which add some energy value (calories) to food; and non-nutritive sweeteners, which are also called high-intensity sweeteners because they are used in very small quantities, adding no energy value to food[1].

2. Natural sweeteners

If you have wandered into a natural food store lately, you might have noticed that the selection of sweeteners seems to have multiplied. Powders, syrups, and liquids with exotic-sounding names catch your eye, each claiming to be tastier, healthier, or more environmentally-friendly than plain old table sugar.

Sugarcane is a tropical grass that has been cultivated by humans for thousands of years. Making what we know as table sugar from sugar-cane can range from a relatively simple to a multistep process, and the final result varies, depending on the specific steps in the process. Light and dark brown, powdered, and granulated white sugars are all highly refined, while others, like those listed below, are made with fewer steps on the processing chain. Fewer steps benefit the environment, because less processing means less environmental impact. It also means that more of the vitamins and minerals that naturally occur in sugarcane remain in the

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end product. All of these sugarcane sweeteners can be found in the baking aisle and/or bulk bins of natural foods stores.

- **Blackstrap molasses**, unlike other sugarcane sweeteners, contains significant amounts of vitamins and minerals. "First" molasses is left over when sugarcane juice is boiled, cooled, and removed of its crystals. If this product is boiled again, the result is called second molasses. *Blackstrap* molasses is made from the *third* boiling of the sugar syrup and is the most nutritious molasses, containing substantial amounts of calcium, magnesium, potassium, and iron. When buying, consider choosing organic blackstrap molasses, as pesticides are more likely to be concentrated due to the production of molasses [5].
- **Rapadura** is the Portuguese name for unrefined dried sugarcane juice. Probably the least refined of all sugarcane products, rapadura is made simply by cooking juice that has been pressed from sugarcane until it is very concentrated, and then drying and granulating it or, traditionally, pouring it into a mold to dry in brick form, which is then shaved. Because the only thing that has been removed from the original sugarcane juice is the water, rapadura contains all of the vitamins and minerals that are normally found in sugarcane juice, namely iron.
- **Sucanat** stands for **su**gar-**ca**ne-**nat**ural, and is very similar to rapadura. It is made by mechanically extracting sugarcane juice, which is then heated and cooled until tiny brown (thanks to the molasses content) crystals form. It contains less sucrose than table sugar (88 percent and 99 percent, respectively).
- **Turbinado sugar** is often confused with sucanat, but the two are different. After the sugarcane is pressed to extract the juice, the juice is then boiled, cooled, and allowed to crystallize into granules. Next, these granules are refined to a light tan color by washing them in a centrifuge to remove impurities and surface molasses. Turbinado is lighter in color and contains less molasses than both rapadura and sucanat.
- **Evaporated cane juice** is essentially a finer, lighter-colored version of turbinado sugar. Still less refined than table sugar, it also contains some *trace* nutrients (that regular sugar does not), including vitamin B2. In Europe, it's known as "unrefined sugar [6]. Natural sweeteners are flooding the market these days. Here's a rundown of some of the most common ones that are not made from sugarcane.
- **Agave nectar** is produced from the juice of the core of the agave, a succulent plant native to Mexico. Far from a whole food, agave juice is extracted, filtered, heated and hydrolyzed into agave syrup. Vegans often use agave as a honey substitute, although it's even sweeter and a little thinner than honey. It contains trace amounts of iron, calcium, potassium and magnesium. Agave nectar syrup is available in the baking aisle at most natural foods stores. The fructose content of agave syrup is much higher than that of high fructose corn syrup, which is of concern since some research has linked high fructose intake to weight gain (especially around the abdominal area), high triglycerides, heart disease and insulin resistance. High fructose corn syrup contains 55% fructose while agave nectar syrup contains 90%. Despite this, it has a low glycemic index because of its low *glucose* content [7].
- **Brown rice syrup** is made when cooked rice is cultured with enzymes, which break down the starch in the rice. The resulting liquid is cooked down to a thick syrup, which is about half as sweet as white sugar and has a mild butterscotch flavor. It is composed of about 50% complex carbohydrates, which break down more slowly in the bloodstream than simple carbohydrates, resulting in a less

dramatic spike in blood glucose levels. It's worth noting that the name "brown rice syrup" describes the color of the syrup, not the rice it's made from, which is white.

- **Honey**, made by bees from the nectar of flowers, is a ready-made sweetener that contains traces of nutrients.
- **Maple syrup** comes from the sap of maple trees, which is collected, filtered, and boiled down to an extremely sweet syrup with a distinctive flavor. It contains fewer calories and a higher concentration of minerals (like manganese and zinc) than honey. You can find it in bulk in some natural foods stores, but don't be fooled by fake maple syrups, which are cheaper and more readily available at the grocery store. "Maple-flavored syrups" are imitations of real maple syrup. To easily tell the difference, read the ingredients list on the nutrition label. True maple syrup contains nothing but "maple syrup." Imitation syrups are primarily made of high fructose corn syrup, sugar, and/or artificial sweeteners, and contain 3 percent maple syrup (or less).

3. The artificial sweeteners

Artificial sweeteners are synthetic sugar substitutes but may be derived from naturally occurring substances, including herbs or sugar itself. Artificial sweeteners are also known as intense sweeteners because they are many times sweeter than regular sugar.

Artificial sweeteners are attractive alternatives to sugar because they add virtually no calories to your diet. In addition, you need only a fraction compared with the amount of sugar you would normally use for sweetness. Artificial sweeteners are widely used in processed foods, including baked goods, soft drinks, powdered drink mixes, candy, puddings, canned foods, jams and jellies, dairy products, and scores of other foods and beverages. Artificial sweeteners are also popular for home use. Some can even be used in baking or cooking. Certain recipes may need modification, though, because artificial sweeteners provide no bulk or volume, as does sugar [2].

There are five artificial sweeteners that have been tested and approved by the U.S. Food and Drug Administration (FDA): acesulfame potassium (also called acesulfame K), aspartame, saccharin, sucralose, neotame. These sweeteners are used by food companies to make diet drinks, baked goods, frozen desserts, candy, light yogurt, and chewing gum. You can buy them to use as table top sweeteners. Add them to coffee, tea, or sprinkle them on top of fruit. Some are also available in "granular" versions which can be used in cooking and baking [8].

Types of artificial sweeteners:

- **Aspartame**

The familiar blue packet in the sugar substitutes bowl usually contains aspartame. With no saccharin-like aftertaste, Equal has become one of the most popular sugar substitute brands. There are four calories per packet.

- **Sucralose**

Sucralose is an artificial sweetener. The majority of ingested sucralose is not broken down by the body, so it is noncaloric. In the European Union, it is also known under the E number E955. Sucralose is approximately 600 times as sweet as sucrose (table sugar), twice as sweet as saccharin, and three times as sweet as aspartame. It is stable under heat and over a broad range of pH conditions. Therefore, it can be used in baking or in products that require a longer shelf life. The commercial success of sucralose-based products stems from its favorable comparison to other low-calorie sweeteners in terms of taste, stability, and safety. Common brand names of sucralose-based sweeteners are Splenda, Sukrana, SucraPlus, Candys, Cukren and Nevella [9].

- **Saccharin**

Saccharin is an artificial sweetener. The basic substance, benzoic sulfilimine, has effectively no food energy and is much sweeter than sucrose, but has a bitter or metallic aftertaste, especially at high concentrations. It is used to sweeten products such as drinks, candies, cookies, medicines, and toothpaste [10].

- **Neotame**

Neotame is an artificial sweetener made by NutraSweet that is between 7,000 and 13,000 times as sweet as sucrose (table sugar). In the European Union, it is known by the E number E961. It is moderately heat-stable, extremely potent, rapidly metabolized, completely eliminated and does not appear to accumulate in the body. The product is attractive to food manufacturers, as its use greatly lowers the cost of production compared to using sugar or high fructose corn syrup (due to the lower quantities needed to achieve the same sweetening), while also benefiting the consumer by providing fewer "empty" sugar calories and a lower impact on blood sugar [11].

4. Sweeteners effects

Artificial sweeteners are one of the many types of food additives that are applied to improve food color, taste, texture, appearance and durability. They are commonly used to replace natural sugar, so that the negative effects that are associated with sugar intake can be significantly reduced. For a number of years, artificial sweeteners were a popular ingredient for the manufacturing of food, but their popularity started to decline after consumers discovered that they have negative health effects.

There are two types of artificial sweeteners: non-caloric sweeteners and sugar alcohols. Non-caloric sweeteners contain no calories, and they are the main ingredient in many foods and drinks. These sweeteners don't cause cavities, and therefore, they're widely considered a better option than natural sugar. Sugar alcohols, on the other hand, contain the same amount of calories as natural sugar, and they're commonly used in chewing gums, candies and throat lozenges. Nevertheless, they still cause fewer dental problems than regular sugar

The use of artificial sweeteners has become controversial due to the health effects that are experienced by people who consume them. The fact that artificial sweeteners are made of chemicals does not help allay the fears and suspicions that are associated with them. Some studies have established that artificial sweeteners such as Saccharin, which is a non-caloric sweetener, can lead to cancer.

Research found that Saccharin was responsible for cancer in lab rats. However, the same cannot be confirmed for human consumption of Saccharin, and attempts to ban the sweeteners have been futile. There is recorded evidence showing that Aspartame, a non-caloric artificial sweetener, can lead to seizures, headaches and attention deficit disorders. Some people experience heart palpitations, constipation and swelling of certain body parts after consuming this artificial sweetener.

In some cases, regular intake of artificial sweeteners has resulted in addiction. Some people have developed an addiction for diet cokes and other sweetened drinks due to the addition of sweeteners. Artificially-sweetened drinks and food can lead to change in taste buds, development of cravings and activation of the pleasure centers in the brain that ultimately causes addiction [1]

Artificial sweeteners are not necessarily harmful to everyone. They can also be beneficial to your health, as they can reduce cavities and tooth decay and lower

body calories. Artificial sweeteners can also be used to neutralize bitterness in certain medicinal products. It's still a good idea to avoid using artificial sweeteners, since the disadvantages clearly outweigh the advantages. Artificial food sweeteners can be detrimental to the health and development of the brain, as well as overall health.

Several alternatives to artificial sweeteners include natural sweeteners such as agave nectar, Stevia, Xylitol and raw honey. Some of these natural sweeteners have medicinal qualities. Stevia, from the Stevia plant, is known to be beneficial for diabetics, as it doesn't spike blood sugar levels. Raw honey is a suitable alternative to sugar because it doesn't cause tooth decay and cavities.

Artificial sweeteners, or sugar substitutes, offer the sweetness of sugar without the calories. Artificial sweeteners are many times sweeter than sugar, so it takes a smaller amount to sweeten foods. This is why foods made with artificial sweeteners may have fewer calories than those made with sugar. Sugar substitutes don't affect your blood sugar level. In fact, most artificial sweeteners are considered "free foods" foods containing less than 20 calories and 5 grams or less of carbohydrates because they don't count as calories or carbohydrates on a diabetes exchange. Remember, however, other ingredients in foods containing artificial sweeteners can still affect your blood sugar level. Also, be cautious with sugar alcohols — including mannitol, sorbitol and xylitol. Sugar alcohols can increase your blood sugar level. And for some people, sugar alcohols may cause diarrhea.

Sugar substitutes are used for a number of reasons, including:

- To assist in weight loss – some people choose to limit their food energy intake by replacing high-energy sugar or corn syrup with other sweeteners having little or no food energy. This allows them to eat the same foods they normally would, while allowing them to lose weight and avoid other problems associated with excessive caloric intake.
- Dental care – sugar substitutes are tooth-friendly, as they are not fermented by the microflora of the dental plaque. An example of a sweetener that can benefit dental health is xylitol. Xylitol works to prevent bacteria from adhering to the tooth surface, thus preventing plaque formation and eventually decay. The carbohydrates and sugars consumed usually adheres to the tooth enamel. Bacteria can feed upon this food source allowing them to quickly multiply. As the bacteria feed upon the sugar, they convert it to acid waste that in turn decays the tooth structure. Xylitol cannot be fermented by these bacteria, so the bacteria have difficulty thriving, thus helping to prevent plaque formation.
- Diabetes mellitus – people with diabetes have difficulty regulating their blood sugar levels. By limiting their sugar intake with artificial sweeteners, they can enjoy a varied diet while closely controlling their sugar intake. Also, some sugar substitutes do release energy, but are metabolized more slowly, allowing blood sugar levels to remain more stable over time.
- Reactive hypoglycemia – individuals with reactive hypoglycemia will produce an excess of insulin after quickly absorbing glucose into the bloodstream. This causes their blood glucose levels to fall below the amount needed for proper body and brain function. As a result, like diabetics, they must avoid intake of high-glycemic foods like white bread, and often choose artificial sweeteners as an alternative.
- Avoiding processed foods – individuals may opt to substitute refined white sugar with less-processed sugars, such as fruit juice or maple syrup.
- Cost – many sugar substitutes are cheaper than sugar. Alternative sweeteners

are often low in cost because of their long shelf-life and high sweetening intensity. This allows alternative sweeteners to be used in products that will not perish after a short period of time.

5. Conclusions

Finally we found out that the artificial sweeteners are very unhealthy, despite the fact that we consume them every day, and they are present almost in every sweet-flavored food. If we would like to live a healthier life, the best solution is using natural sweeteners. One of the obstacles is the high price of natural sweeteners; because of this people usually choose artificial sweeteners. In conclusion, the assertions that artificial sweeteners are safe, healthy and help in weight loss are false.

There are many natural sweeteners unkown to people, whose benefits of are important and necessary to our bodies.

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