

Mysterious Sweeteners

Taste & Prejudice

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Moto: „ Sugar is the best sweetener Better than sucrose, glucose and fructose“¹

Introduction

Mystery of sweeteners. All that, what is not enough explored, may be mysterious. This study deals with four artificial, intensive, sweeteners. Saccharin, aspartame, acesulfame K and sucralose. These mysterious sweeteners invoke a whole range of questions and they are discriminated against sugar.

Sweeteners are approved as safe by FDA², EFSA³, JECFA⁴ and others. If they are approved by competent institutions, should be safe. This should finished all discussions. But on the contrary. This opens endless discussions. Are swweteners safe and useful? .

Taste: Sweeteners should taste like sugar! Why sweeteners should taste like sugar? After all, sugar is not food. Nobody usually consumes sugar. Sugar is only an ingredient. Also the artificial sweeteners are ingradients - sugar substitutes. What is bad with sugar? In higher doses, say more than 50 g / day, may be dangerous for your health. And what is bad with sweeteners?

Marketing of sweeteners emphasizes usually, that sweeteners taste like sugar⁵. It is not true. Sweeteners do not taste like sugar, but in spite of that, they will sweeten your food or beverage. Many people say, that they do not like taste of sweeteners. But I tell them: „You get used to it, I got used to it.“ Sweet taste is not absolute phenomenon. When I

¹ An incredible, but authentic statement, by a director of a sugar factory

² Food and Drug Administration (USA)

³ European Food Safety Authority (EU)

⁴ Joint FAO/WHO Expert Committee on Food Additives

⁵ For example sucralose is marketed with slogan:“ Made from sugar, tastes like sugar“

tell, „...the wine had a fruity taste“, it does not mean, that the wine tastes exactly as some fruit

Prejudice: *Artificial sweeteners are at a disadvantage due to their origin. They were created in chemical laboratory and not in a laboratory of nature. Some nutritionists deadly hates sweeteners from this reason. But I tell them: „Refined and bleached sugar, made from sugar beet or sugar cane, is the same substance, as sucrose, C₁₂H₂₄O₁₂, made in chemical laboratory.“*

Artificial sweeteners are used in modern diets. They are widely used in prevention of obesity and type 2 diabetes. But sweeteners are also suspicious, that do not help, but harm. Remarkable! Some scientists are looking for evidence to claim, that sweeteners are unsafe, induce glucose intolerance, metabolic syndrom, weight gain, cravings for sugar, or produce some metabolics that are carcinogenic in the CNS⁶.

In the last century suspicion dealt mainly with potential carcinogenicity of saccharin and aspartame. Following research this suspicion did not confirm. In 21th century, with more sophisticated methods of research , suspicion focused on digestion and brain. Some works raised alarms whether NNS⁷ used in humans can exacerbate metabolic disorders due to dysbiosis and raise the risk for progression to diabetes and obesity?⁸

.Recently was published study, „Health outcomes of non-nutritive sweeteners: analysis of reserch landscape,“⁹ Rewiev of 372 studies. With conclusion: „*There are numerous gaps in evidence related to the health of NNS¹⁰ in both healthy and non-healthy populations....there are numerous health outcomes, like incidence of headaches in association with NNS consumption, depression, Alzheimers disease, behavioural effects, cardiovascular effects,which were investigated in only few studies and further research aktivty is needed.*“

Growing concerns about health and quality of life have encouraged people to avoid sugar consumption. Sugar is generally accepted as non- addictive drug, but very

⁶ Central nervous system.

⁷ Non-nutritive sweeteners

⁸ Source: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4899993>. © 2.11.2017

⁹ Source: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5591507/>, published Sep 8, 2017

¹⁰ Non-nutritive sweeteners

cautious is, that sugar in most soft drinks on sale, highly exceeds recommended daily limits! **High doses of sugar could be dangerous for your health!**

Artificial sweeteners are generally considered as safe. Theirs safety was confirmed by hundreds of scientific studies. But some nutritionists hates artificial sweeteners. Just suspect them.

We could tell stories about sweeteners. For example, how saccharin and sucralose consumption was associated with an impaired glucose tolerance¹¹. How Ramazzani institute was linking sucralose and cancer¹². How aspartame metabolites supposedly poison CNS¹³.

Consumers do not know sweeteners, they lack a lot of basic information. For example, ADI¹⁴ value is important value for sweetener consumers. How many cosumers know what it means? I think almost nobody.

Courage to change

Artificial NNS when consumed in daily acceptable limits can help in limiting carbohydrate and energy intake, as a tool to manage weight and blood glucose. Many nutritionists however claim, that sweeteners are not sufficiently researched For producers and consumers is not simple to replace sugar with a sweetener. It requires courage! Like, in the 16. century. it was not simple, to claim that the earth is round. In the beginning of 20.century, it was necessary to have courage, to claim, that the metal vehicle is better, than a live horse.

Formerly producers were men, who led theirs customers. Now producers ask public opinion agences. The best selling word in food industry today, is „*natural*“.But, if the word „*natural*“ were really the highest quality sign, it would be Africa, the most advanced continent.

¹¹ Suez, J.:et all Artificial sweeteners induce glucose intolerance by altering the gut mikroflóra. Nature 2014

¹² Source: www.foodnavigator-usa.com/content/view/print/1218744

¹³ Source: www.ncbi.nlm.nih.gov/pubmed/23553132

¹⁴ Acceptable Daily Intake

People do not seek food only to satisfy energy needs. They also seek for pleasure from food. Have the courage and patience to seek pleasure from sweeteners. There are many different types of sweeteners with various sweet profiles.

Saccharin¹⁵ one of the most used sweeteners in the world. Discovered in 1879 in Baltimore, USA. During the first half of 20th century it was the most successful sugar substitute in the world. Saccharin, a petroleum derivative, is a white crystalline substance, about 400 to 500 times sweeter than sugar.

Concern peaked in 1977, after publication of a study, indicating a cancer in rats fed by large doses of saccharin. This resulted in the carcinogenicity, genotoxicity, hepatotoxicity and teratological studies of saccharin in animals, and humans by the most highly reputable global health and science organizations worldwide. None of these studies ever showed a clear casual relationship between saccharin consumption and health risks in humans at normal dosage. The scientific data supporting saccharin's safety include the following¹⁶

- extensive research on human population has established no association between saccharin and cancer,
- saccharin is not metabolized and does not react with DNA,
- saccharin is approved in more than 100 countries around the world and has been reviewed and determined as safe, by JECFA (WHO), by EFSA (EU) , FDA (USA) and many others,
- saccharin is not caloric, not cariogenics and does not show a glycemic response

Despite, some nutritionists still looking for evidence, that saccharin is a „bad boy“. The main reason is, that it is produced from toluene, or methyl anthralinate. The second reason is, that it has bitter or metallic aftertaste. Third reason is that saccharin reportedly modifies gut microbiota which in turn causes glucose intolerance¹⁷.

¹⁵ Metabolism and Toxicology of Saccharin. © Jun. 2013 In: <http://anyflip.com/stcj/zdez/basic>

¹⁶ Saccharin. Toxicological Research. © Febr. 2005. In: <http://enhs.umn.edu/current/saccharin/toxstudies.html>

¹⁷ Suez, J.:et all Artificial sweeteners induce glucose intolerance by altering the gut mikroflóra. Nature 2014

Aspartame safety confirms about 110 scientific works. Aspartame has been found to be safe for human consumption by more than ninety countries worldwide. Aspartame is approved by FDA, EFSA, JECFA WHO and others, as safe sweetener with ADI¹⁸ = 50mg/kg. Aspartame is used in many beverages, chewing gums, desserts, milk products etc. But, is it really safe?. It is composed from two common amino-acids – phenylalanine and aspartic acid. Aspartame is rapidly hydrolyzed in the small intestines, and breaks down into components, including aspartic acid, phenylalanine and methanol..

Some nutritionists deadly hate aspartame. For them it is evil among sweeteners. Over a hundred side effects can accompany the use of aspartame!. Commonly reported symptoms of an aspartame reaction include¹⁹: headache, change in vision, hallucination, memory loss, nausea and vomiting, dizziness, joint pain etc. High concentration of amino-acids, in the form of aspartame flood your central nervous system and can cause excessive firing of brain neurons Long-term use of excitotoxins like aspartame are linked to degenerative brain diseases, like Alzheimer's, Parkinson's and general dementia.

Error of this preview lies in a scale. While amino-acids intake in common food counts in tens of grams, intake amino-acids in association with aspartame, counts in tens of milligrams. Aspartame is about 200 times sweeter than sugar, and therefore, when I want to substitute, e.g. 20 grams of sugar, I need only 0,1 grams of aspartame. Therefore negative effects connected with use of aspartame are negligible.

For 60 kg weighing adult, is acceptable daily intake of aspartame $50 * 60 = 3$ g of aspartame. And 3 g of aspartame equals about $3 * 200 = 600$ g of sugar. It means, that, 12 times prevails recommended daily intake of sugar.. Nobody consume such quantity.

Acesulfame K (acesulfame potassium) was discovered in 1997. Is very stable , very good soluble in water, and about 200 times sweeter than sugar. In lower concentrations is sweet without bitter aftertaste. A strong synergistic effects occurs in mixtures with aspartame.

¹⁸ ADI = maximum value of acceptable daily intake

¹⁹ <https://www.ncbi.nlm.nih.gov>

Of all artificial sweeteners, acesulfame K has undergone the least scientific scrutiny. Critics say, that acesulfame potassium has not been studied adequately. Some toxicological studies were carried out with acesulfame K. Oral toxicity is negligible, no mutagenicity was found. In spite of this, as most artificial sweeteners, for some nutritionists, is controversial. One reason to avoid is - because it can affect your thyroid, which can decrease your metabolism - it could contribute to weight gain. Hopefully, the small amounts added to foods could not harm. ADI value of acesulfame potassium is 9 mg/kg body weight (bw), i.e. it could replace up to 100 grams of sugar daily for 60 kg weighing adult.

Acesulfame K is quickly absorbed, but not metabolized and is excreted by the kidneys.. Acesulfame K is used in soft and fruit drinks, in milk products and in bakery products, often in mixtures with other intensive sweeteners, especially aspartame; and also with polyols.²⁰

It is known, that in the short term, acesulfame potassium doesn't raise your blood sugar or insulin. However, the long-term effects of consistent use by humans, are unknown. The decision to consume acesulfame potassium or not, should be made on an individual basis. If you like it and tolerate it use it! If acesulfame K makes you feel bad, avoid it!

Sucralose was born in England in 1976. It is about 600 times sweeter than sugar, with taste profile similar to sugar. Sucralose is heat stable, good soluble in water. More than 110 safety studies enable approving of sucralose as general purpose sweetener for food. ADI for sucralose is 5 mg/ kg (bw). For adult weighing 60 kg, can replace daily up to $0,005 * 60 * 600 = 180$ g of sugar.

Sucralose is not metabolized in humans and is excreted by urine and by faeces, within five days after consumption.²¹ Commercial success of sucralose-based products stems from its favorable comparison to other low-calorie sweeteners in terms of taste, stability and safety.²² Sucralose could be used in combination with other sweeteners, e.g. aspartame and acesulfame K.

²⁰ Sugar alcohols, e.g. xylitol, erythritol, maltitol, etc. They are also called bulk sweeteners.

²¹ <https://www.ncbi.nlm.nih.gov/pubmed/10882816>

²² <http://www.foodnavigator-usa.com/content/view/print/1218744>

But not only good news are around sucralose. In last year was published review, that the zero-caloric sweetener may increase, rather than decrease body weight²³. In 2016 was published study²⁴ by Dr. Soffritti. This study is linking the consumption of sucralose and cancer in mice. This study was not accepted by EFSA, Tate & Lyle and others, which criticized methodology of Dr. Soffritti's research. But in the USA, the US Center for Science in the Public Interest (CSPI) downgrades safety rating of sucralose, with reference to above mentioned Dr. Soffritti's report.

Conclusions

Today is situation following. Sugar could be dangerous for your health and scientists recommend to decrease sugar consumption. As sugar substitutes, could be used either natural sweeteners or intensive sweeteners. The disadvantage of natural sweeteners is, that most of natural sweeteners are sugars, so we replace sugar by sugar. The disadvantage of intensive sweeteners is, that they are controversial?

If you prefer natural sugar substitute, try *The Top 5 Natural Sweeteners*:

1. Raw Honey (1 tablespoon – 64 calories)
2. Dates (1 date – 66 calories)
3. Coconut Sugar (1 tablespoon – 45 calories)
4. Maple Syrup (1 tablespoon – 52 calories)
5. Sucrose²⁵ (1 tablespoon - 60 calories)

If you want to avoid sugar and prefer sweeteners, try *The Top 5 Intensive Sweeteners*:

1. Saccharin (0 calories)
2. Sucralose (0 calories)
3. Aspartame (1 tablespoon²⁶ – 60 calories)
4. Stevia (0 calories), from natural resources.
5. Acesulfame K (0 calories)

²³ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5591507>

²⁴ In Journal of Occupational and Environmental Health. Source: Ramazzani Institute

²⁵ Doctors consider sugar (sucrose), in higher doses, as dangerous

²⁶ One tablespoon of aspartame will replace 3 kg of sugar.

Some nutritionists consider NNS²⁷ safe and useful. Some nutritionists consider NNS as safe, but useless. Some nutritionists consider it as suspicious and some as dangerous. **So what??**

- Should we test a hypothesis: *Sugar is better than sweetener.*? True or False? To uncover secrets of sweeteners systematic research is necessary. Compare NNS with sugar *under otherwise the same conditions*. Test the presence of metabolic syndrom - body weight, blood pressure, blood sugar, triglycerides and HDL, LDL cholesterol.
- Consider the facts:
 - It is known, that hungry mice are looking for caloric, may be disgusting, food. Satisfied mice like sweet,, Why should be sweetener caloric?
 - Artificial substance, after its creation, is also a part of nature. Why is artificial sweetener worse than natural?
 - Taste of food is relative. People consume various tastes and flavors. Why should sugar be the best sweetener?
- Statistic research in USA, in the year 2013, has shown, that consumption of soft drinks sweetened by sugar increases body weight of adults; on the contrary, consumption of soft drinks sweetened by NNS, slightly decreases body weight.

We produce sweeteners for retail from 1991, and concurrently we monitor global reports about sweeteners. It looks like, that for some people, sweeteners are of help and for some not. To blame is personal brain and digestive system-not sweeteners. People are different.

Today, doing a lawyer to artificial NNS, requires courage, because consumer likes the word *Natural*. According to our opinion, sweetener of future will be NNS. Optimum is natural NNS. Well known are steviol-glycosides and monk fruit. But consumer wants not only health but also taste. Therefore perspective sweeteners should be a mixtures of NNS with prebiotics, polysaccharides, polyols and and flavors. In future we could call them SE- sweet taste enhancers .

²⁷ NNS = non-nutritive sweetener, or intensive sweetener; more than 200 times sweeter than sugar

SUGAR OR NOT SUGAR-IT IS A QUESTION

