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Can aspartame-sweetened products safely help with weight loss?

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Abstract

One of the main causes of obesity is the high consumption of products rich in easily absorbed carbohydrates. Sweet products with lower energy value, which sweetness comes from artificial sweeteners are becoming more and more popular. One of the most examined and popular is aspartame. This sweetener is broken down in the human body among others to methanol, which is oxidized to formaldehyde and formic acid, that are toxic to the human body. Furthermore, there is an ongoing discussion about the potential carcinogenicity and the impact of aspartame on the gut microbiota. A literature review was conducted to determine whether aspartame could be considered a safe weight loss aid.

European Food Safety Authority (EFSA) guidelines indicate that the toxic dose of aspartame in chronic use is 4000 mg per every kilogram of body mass per day. On the other hand, there are studies on rats that indicate that EFSA's position is overly optimistic. However, it should be noted, that so high consumption situations of this sweetener that would allow to approach the recommended daily maximum are extremely rare.

The amount of methanol provided by aspartame-sweetened foods also makes it extremely difficult to achieve toxic levels. Aspartame has also been shown not to affect the gut microbiota.

What is important from a dietary point of view, study that compared the consumption of "light" drinks with water showed that people on a diet and consuming "light" drinks achieved significantly greater weight reduction (approx. 1.24 kg) compared to people consuming only water. The use of aspartame as a substitute for sugar may help in reducing excess body weight. However, attention should be paid to the inconclusive results regarding the acceptable safe level of consumption of this sweetener.

Keywords: Aspartame, Sweeteners, Obesity, Weight Reduction Diet

Introduction

Excess body weight is a growing problem not only in well developed countries, but also in those still developing. The main factors influencing this are lifestyle mistakes, such as reduced physical activity and bad eating habits consisting in excessive consumption of high-calorie products [1]. Obesity affects all age groups, regardless of gender, race or origin. In some well developed countries it is estimated that the problem of overweight and obesity affects about 50-65% of the population. Research conducted by the World Health Organization reports that in 2005 the problem of overweight affected 1.6 billion adults worldwide, and obesity - 400 million [2,3].

One of the main factors influencing the development of overweight and obesity may be the products supplied to the body with a high content of rapidly absorbed carbohydrates. Among people on a reduced calorie diet, the phenomenon of a strong need to consume "sweet" food, which is the source of the condensed content of sucrose or glucose-fructose syrup, is very common [4]. Therefore, sweet products with lower energy value are gaining more and more popularity. The composition of these products is largely based on low-calorie sweeteners [5]. These substances usually include saccharin, acesulfame K, sucralose, thaumatin, stevia, glycyrrhizin, and aspartame, which is highly controversial [4].

State of knowledge

Aspartame is considered to be one of the most studied chemicals in nutrition. Numerous studies on the socially disturbing aspartame are still contradictory [4], which makes it a scientifically interesting substance. The sweetener in question is a dipeptide that is decomposed in the human body into aspartic acid, phenylalanine and methanol. Methanol is produced by enzymatic treatment with chymotrypsin, which reacts with the methyl group of aspartame. In the next step, methanol is oxidized to formaldehyde and formic acid. Both of these compounds are toxic to the human body [6]. However, it should be noted that due to the use of minimal amounts of aspartame in food products, the methanol into which it metabolizes does not pose a significant risk to human health. A 330 ml can of aspartame-sweetened cola drink provides an amount of methanol comparable to a 500 ml bottle of some fruit juices, such as orange or grapefruit juice [7].

Aspartame has gained immense popularity because it has the most similar flavor to sucrose. The caloric content of this sweetener is 4 kcal/g, which is equivalent to that of sucrose. However, 1g of aspartame is about 200 times sweeter than sugar, and therefore its administration in much smaller amounts produces the same organoleptic effect, which translates into lower production costs while reducing the caloric content of the product. For example, a pinch of aspartame with just 0.1 kcal of energy has a sweetness equal to a teaspoon of sugar with an energy value of 16 kcal [8,6].

During the discussion about aspartame, the argument about its potential carcinogenic effect is also often raised. The EFSA (European Food Safety Authority) guidelines published in 2013, resulting from the analysis of many studies on an experimental model such as rats, have shown that the toxic dose of aspartame in chronic use reaches 4000 mg per every kilogram of body mass (bm) a day. However, the investigators did not exclude the possibility of toxic effects at doses lower than 4,000 mg/kg bm/day. Moreover, in the same guidelines, researchers remind that the safe dose for consumption is 40 mg/kg bm/day [8].

On the other hand, other studies have emerged that EFSA's position on the maximum intake of aspartame may be overly optimistic. In a long-term study at the European Ramazzini Foundation, eight-week-old rats were given aspartame with their feed until they died naturally. There was a "statistically significant" dose related increase in the incidence of cancers such as lymphomas and leukemias, tumors of the renal pelvis, and malignant nerve tumors [9].

These studies indicate the potential carcinogenic properties of aspartame, which may be capable of producing malignancy at a lower dose level than the current acceptable daily human consumption. However, EFSA contested these studies, arguing that due to the high percentage of spontaneous cancers, problems with diagnosing the type of cancer and concerns about the impact of chronic infections, no far-reaching conclusions could be drawn from this study. They also promise to continue monitoring the case [10, 11].

It is also worth noting that EFSA's ADI value for aspartame (40 mg/kg bm/day) is very difficult to consume during the day because, as a society, we are not approaching exceeding this value, even taking into account the risk group of children. One liter of "light" cola contains 529 mg of aspartame, so an 80 kg person would have to drink 5.5 liters of the drink a day to exceed the limit set by EFSA. [8] By drinking the same amount of classic cola, 583g of sugar would be provided, adding an additional 2332kcal to the diet.

Caring for the health and general homeostasis of the human body, it is also necessary to look at the impact of the described sweetener on the intestinal microbiota. It turns out that aspartame does not affect the human gut microbiome. Aspartame is very rapidly hydrolyzed in the small intestine. In fact, even after taking very high doses of aspartame (>200 mg/kg bm/day), no aspartame was found in the blood because of its rapid breakdown. When ingested, aspartame breaks down into the aforementioned aspartic acid, phenylalanine and methanol, which are absorbed very quickly so that it does not reach the large intestine [12].

P.J. Rogers et al. conducted an extensive meta-analysis of studies comparing drinking artificially sweetened, low calories drink with water. The results of the meta-analysis showed that people on a diet and consuming "light" drinks achieve a much greater reduction in body weight (approx. 1.24 kg) compared to people who consume only water.

The reason for this may be the fact that a person consuming a drink based on aspartame or other sweetener does not want to reach for high-calorie snacks as often as the person consuming water alone [13].

Summary

In summary, the impact of aspartame use on the health of the human body cannot be considered fully understood, which prompts further research on this issue. Based on the analyzed literature, it can be concluded that the use of aspartame as a substitute for sugar may help in reducing excess body weight. However, attention should be paid to the inconclusive results regarding the acceptable safe level of consumption of this sweetener. Therefore, the use of food products containing aspartame should be taken in moderation, taking into account the shortages of scientific sources studying the consequences of high consumption of this sweetener.

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