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Artificial Sweeteners and Glycemic Control: Implications for Metabolic Health

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Abstract
Artificial sweeteners (AS), commonly used as sugar substitutes, have gained popularity due to their low caloric value and perceived benefits in supporting glycemic control. Initially introduced to help reduce sugar consumption, their actual impact on glucose metabolism in humans remains unclear. This review explores the current scientific evidence on the relationship between artificial sweeteners and glycemic control, with a focus on individuals with or at risk of metabolic disorders such as type 2 diabetes and insulin resistance. Key mechanisms are discussed, including the influence of artificial sweeteners on insulin response, sweet taste receptor activity, and gut microbiota composition. Human studies have produced mixed results: while some suggest potential benefits in terms of maintaining glucose balance, others indicate possible disturbances in glycemic regulation. Given the widespread consumption of these compounds, especially among people aiming to manage body weight or blood sugar levels, it is essential to better understand their long-term metabolic effects. This review underscores the importance of further well-designed clinical studies to clarify the role of artificial sweeteners in glycemic control and metabolic health.

Keywords: Artificial sweeteners, Glycemic control, Glucose metabolism, Insulin response, Non-nutritive sweeteners, Metabolic health, Type 2 diabetes, Sweet taste receptors, Sugar substitutes

Introduction

The consumption of sugars, mainly as sucrose and glucose-fructose syrups, has dramatically increased worldwide and growing concerns about their adverse effects on health and metabolic diseases, such as metabolic syndrome, cardiovascular diseases, and type 2 diabetes (T2D), have motivated people to reduce the consumption of free sugars. (31)

Artificial sweeteners have been developed as substitutes for sugar, providing a significantly more intense sweetness than sucrose while contributing little or no calories. As food additives, they mimic the taste of sugar and are therefore commonly referred to as sugar substitutes. Many consumers choose products containing low-calorie sweeteners to enjoy a sweet taste without the associated caloric intake. This dietary option may be particularly beneficial in the management of obesity and diabetes mellitus. (22)

Since their FDA approval, artificial sweeteners and their benefits on metabolic health have been questioned. (23) The US Food and Drug Administration (FDA) has approved six artificial sweeteners for use in food: saccharin, aspartame, acesulfame potassium (Ace-K), sucralose, neotame, and advantame. (24)

In Europe, 19 compounds are authorized for use as sweeteners, 7 of them being classified as polyols (low-calorie sweeteners) and the remaining 12 as non-calorie sweeteners, of which the most notable ones are acesulfame K (E950), aspartame (E951), cyclamates (E952), saccharin (E954), sucralose (E955), neotame (E961), and steviol glycosides (E960) These compounds have very different chemical structures, although all of them have in common the ability to potently activate some of the multiple potential ligand-binding sites of the sweet-taste receptors in human subjects (1)

Saccharin is the oldest artificial sweetener and was developed at Johns Hopkins University in 1879. It is 200 to 700 times sweeter than sucrose and is commonly used in soft drinks, candy, salad dressings, chewing gum, and non-edible products like toothpaste, mouthwash, and medications [25].

Aspartame was invented in 1965 by James M. Schlatter. The attractiveness of aspartame as a sweetener is since it is about 200 times sweeter than sugar, while its calorific value, at the concentrations giving the impression of sweetness, is almost zero. However, the taste of

aspartame is not identical to that of regular sugar: the flavor takes longer to appear, and typically has an aftertaste. Food with aspartame must be labeled with the information: “contains phenylalanine”. In addition, the labeling of foods containing aspartame must indicate that they are not recommended for cooking and baking . Although many studies have been performed to determine the health effects of aspartame, the results of its long-term use remain difficult to predict and its use in pharmaceutical and food products remains controversial . (26)

Neotame and advantame are aspartame analogs (28,29). Unlike aspartame, neotame and advantame are non-calorie sweeteners. Neotame is artificial sweetener that is 7000–13,000 times sweeter than sugar. Neotame can be metabolized by esterase into de-esterified neotame and methanol and eliminated in the urine and feces within 72 h. Advantame is formally a secondary amine of aspartame. A total of 89% of the ingested advantame is excreted in feces, and 6.2% is excreted in urine. Interestingly, advantame is also a flavor enhancer for dairy, fruit, citrus, mint, etc. Advantame is involved in milk products, frozen dairy, nonalcoholic beverages, and chewing gums.(28,29)

Sucralose is the most commonly used artificial sweetener. Sucralose is produced by the chlorination of sucrose. Sucralose is 600 times sweeter than sucrose. Sucralose is included in tabletop sweeteners, baked goods, frozen desserts, fruit juices, chewing gum, and dairy products. Sucralose is water soluble and stable under heat. Sucralose is not metabolized in the body, so it is non-caloric. The majority of sucralose is excreted into feces, and 11–27% is absorbed and excreted in urine. (1)

Acesulfame-potassium (ACE-K) is a calorie-free artificial sweetener, discovered in 1967 by German scientist Karl Clauss. It is approximately 200 times sweeter than sucrose when in a 3% solution. It was approved by the U.S. Food and Drug Administration (FDA) in 1988 for use in a variety of foods and beverages and is often used in combination with other low- and no-calorie sweeteners such as aspartame or sucralose. ACE-K is known for its environmental persistence and is frequently detected in wastewater, making it a useful tracer for anthropogenic contamination. While its safety for human consumption is well established, research into its ecological effects has only recently begun to emerge. (27)

Excessive intake of added sugars, particularly in the form of sugar-sweetened beverages, has been associated with adverse metabolic effects including increased risk of obesity, dyslipidemia, and type 2 diabetes. While artificial and natural sweeteners have been developed to reduce

reliance on table sugar, their health impact remains a subject of debate. Some non-nutritive sweeteners may have metabolic consequences of their own, and many fail to provide consistent evidence for promoting weight loss or improving glycemic control. Natural rare sugars and alternative sweeteners such as steviol glycosides offer promising benefits, but require further investigation. Ultimately, limiting overall consumption of sweeteners both caloric and non-caloric may be the most prudent approach for promoting metabolic health and preventing chronic disease. (30)

The analysis is based on a comprehensive literature search of studies published between 2010 and 2025 using PubMed, Scopus, and Google Scholar. By synthesizing evidence from clinical trials and observational studies, this review aims to provide a comprehensive evaluation of the impact of artificial sweeteners on glycemic control, identify gaps in current knowledge, and explore their implications for long-term metabolic health.

Discussion

Numerous studies have suggested a link between artificial sweeteners and disturbances in the gut microbiota, which may result in impaired glucose metabolism.

Suez J et al. study was a randomized controlled trial designed to investigate the effects of four commonly used non-nutritive sweeteners (NNS)—saccharin, sucralose, aspartame, and stevia on glucose metabolism and gut microbiota composition in healthy adults. The trial included 120 participants who were randomly assigned to six groups: four groups received one of the sweeteners at doses below the acceptable daily intake, one group was given glucose sachets to control for the glucose vehicle in the sweetener mixtures, and one group did not receive any supplement. The study lasted 29 days and was divided into three phases: a 7-day baseline period, a 14-day intervention period where participants consumed their assigned supplement, and a 7-day follow-up period after stopping supplementation. Throughout the study, participants wore continuous glucose monitors (CGM) to track blood glucose fluctuations in real-time. Additionally, they performed multiple oral glucose tolerance tests (OGTT) at home to assess glucose handling, provided stool and oral samples for microbiome analysis, and underwent blood tests and anthropometric measurements at key time points. They also logged their diet and physical activity via a smartphone app to control for lifestyle factors. Results showed that saccharin and sucralose intake significantly impaired glucose tolerance during the intervention period, as demonstrated by increased glucose levels following OGTT and CGM data. In contrast, aspartame and stevia did not affect glucose metabolism significantly. The study also found that

saccharin and sucralose caused marked alterations in the gut microbiota, including changes in bacterial composition and metabolic pathways, which correlated with the impaired glycemic control. No such microbiome changes were observed with aspartame or stevia. In conclusion, this comprehensive study demonstrates that the effects of non-nutritive sweeteners on glucose metabolism are specific to the type of sweetener and mediated largely through changes in the gut microbiome. Saccharin and sucralose negatively affect glucose tolerance and microbiome composition, whereas aspartame and stevia appear metabolically neutral. These findings highlight the importance of considering individual microbiome profiles in evaluating the metabolic impact of artificial sweeteners and suggest the potential for personalized dietary recommendations to mitigate adverse effects.(2)

Tey SL et al. in a randomized, crossover study investigated the effects of consuming beverages sweetened with either sucrose, artificial non-nutritive sweeteners (aspartame), or natural non-nutritive sweeteners (monk fruit extract and stevia) on 24-hour glucose profiles in ten healthy young males. Participants attended four test sessions, each involving the consumption of a standardized breakfast followed by one of the test beverages, and an ad libitum lunch. Continuous glucose monitoring was used to measure interstitial glucose levels throughout each 24-hour period. The study found no significant differences in mean 24-hour glucose levels, incremental area under the curve (iAUC), total glucose exposure, or glycaemic variability between sucrose and any of the non-nutritive sweetener treatments. These results suggest that replacing a single serving of a sucrose-sweetened beverage with natural or artificial non-nutritive sweeteners has minimal impact on daily glucose fluctuations in healthy young males. The authors conclude that further research is needed with longer intervention periods, higher doses, and more diverse populations to better understand the metabolic effects of non-nutritive sweeteners.(3)

Ahmad SY et al. study investigated the effects of sucralose and aspartame consumption on gut microbiota composition and short-chain fatty acid (SCFA) production in healthy adults. Seventeen participants aged 18 to 45 with a BMI of 20-25 completed two 14-day treatment periods of either sucralose or aspartame intake, separated by a four-week washout. The doses corresponded to 20% and 14% of the acceptable daily intake for sucralose and aspartame, respectively. Fecal samples collected before and after each treatment were analyzed for microbiome composition and SCFA levels. The results showed no significant changes in the relative abundance of major bacterial taxa, overall microbiota community structure, or SCFA

concentrations after consumption of either sweetener. The study concluded that realistic daily intake of sucralose or aspartame over two weeks has minimal impact on gut microbiota composition and SCFA production in healthy individuals.(4)

Another randomized, double-blind, crossover study conducted by Ahmad SY et al.investigated the effects of daily consumption of pure sucralose and aspartame on glucose metabolism in healthy adults. Seventeen participants (10 females, 7 males; mean age 24 years; BMI 22.9 kg/m²) consumed beverages sweetened with standardized doses of sucralose (20% of ADI, 0.136 g) or aspartame (14% of ADI, 0.425 g) daily for two weeks, with a four-week washout period between treatments. Blood samples were collected to measure glucose, insulin, active GLP-1, and leptin concentrations, as well as insulin sensitivity indices. The results showed no significant changes in glucose metabolism markers or insulin sensitivity following either sweetener compared to baseline. The study concluded that realistic daily intakes of pure sucralose or aspartame over two weeks do not affect glucose metabolism in healthy adults. However, longer-term studies and research including participants with higher BMI or metabolic disorders are needed to confirm these findings.(5)

Suez J et al. study investigates the causal effects of non-nutritive artificial sweeteners (NAS) on metabolic homeostasis using animal models and human data, with a focus on the gut microbiome. Due to challenges in human interventional studies, mice were supplemented with commercial and pure forms of saccharin, sucralose, and aspartame. After prolonged exposure, all NAS-consuming mice developed glucose intolerance, which was reversed by antibiotic treatments targeting gut bacteria, indicating a microbiome-mediated effect. Microbiome sequencing revealed distinct compositional changes linked to metabolic dysfunction. Fecal transplants from NAS-exposed mice induced glucose intolerance in germ-free mice, confirming microbiome causality. Parallel human studies identified associations between NAS intake, altered microbiome composition, and metabolic parameters in a large cohort, with a small intervention showing variable glycemic responses correlated with individual microbiomes. The findings highlight the microbiome's central role in mediating NAS effects on host metabolism, suggest personalized dietary responses to NAS, and call for further research to elucidate mechanisms, dose effects, long-term outcomes, and reversibility of these metabolic alterations. (6)

Steinert RE et al. in a placebo-controlled, double-blind, six-way crossover study investigated the effects of carbohydrate sugars and artificial sweeteners (AS) on gastrointestinal satiety

peptides and appetite in twelve healthy subjects. Participants received intragastric infusions of glucose, fructose, or AS (aspartame, acesulfame K, sucralose) dissolved in water, as well as a control (water alone). Additionally, four subjects received 2-deoxy-D-glucose, a non-sweet, non-metabolizable sugar analogue. Results showed that glucose significantly stimulated GLP-1 and PYY secretion and reduced fasting plasma ghrelin, while fructose had a lesser effect. Both sugars increased satiety and fullness compared to water, though not significantly. In contrast, equisweet doses of AS did not affect gastrointestinal peptide secretion and had minimal impact on appetite. The sugar analogue increased hunger ratings without altering peptide levels. These findings suggest that the secretion of GLP-1, PYY, and ghrelin depends on factors beyond sweetness detection or structural similarity to glucose.(7)

Ahmad SY et al. review examined clinical trials investigating the effects of non-nutritive sweeteners, specifically aspartame and sucralose, on glucose metabolism and gut hormones. The studies varied in design and protocols, including assessments of blood glucose, insulin, and gut hormone levels following consumption of these sweeteners. Most trials found no significant impact of aspartame or sucralose on glucose, insulin, or gut hormone concentrations. However, a few studies reported changes: aspartame was shown in two trials to affect glucose, insulin, and glucagon-like peptide 1 (GLP-1) levels, while sucralose showed mixed results, with some studies indicating increased, decreased, or unchanged glucose levels. Additionally, only a small number of studies observed increased GLP-1 concentrations after sucralose intake. Insulin sensitivity findings were also inconsistent, with some trials reporting decreases and others increases following sucralose consumption. Overall, the evidence remains contradictory, largely due to differences in study protocols and methodologies.(8)

Bayındır Gümüş A et al. in theirstudy investigated the acute effects of saccharin consumption on blood glucose and insulin responses in healthy adult males. Nine participants received, in random order, intragastric preloads of water, sucrose (75 g), or saccharin (240 mg, matched for sweetness to sucrose) one hour before a standard breakfast. Blood glucose and serum insulin levels were measured at multiple time points after preload consumption. The results showed a significant difference in blood glucose only at 15 minutes between sucrose and saccharin trials, with higher glucose after sucrose. At 60 minutes, insulin levels were significantly higher after sucrose compared to saccharin and water. Although insulin levels after saccharin were generally higher than water, these differences were not statistically significant. The study concluded that

saccharin does not affect blood glucose levels acutely, but the impact on insulin secretion remains unclear and warrants further investigation of long-term effects.(9)

This pilot study conducted by Skokan I et al. investigated the effects of artificial sweeteners on blood glucose concentration in 16 overweight or obese patients with pre-diabetes and hypertension. Using a triple cross-over design, participants consumed 150 ml of water containing either 6 g of table sugar, an artificial sweetener mixture (containing saccharin and cyclamic acid), or plain water (control) in separate trials spaced weeks apart. Blood glucose levels were measured before and at 5, 15, 30, and 60 minutes after intake. Statistical analysis showed no significant changes in blood glucose after consumption of sugar or artificial sweeteners. A significant decrease in blood glucose was observed only in the control (unsweetened) condition, reflecting a normal physiological response after lunch. The study concluded that neither artificial sweeteners nor sugar significantly affect short-term blood glucose levels, and no evidence was found to support the hypothesis that artificial sweeteners induce a “cephalic insulin reflex” or hunger stimulation. Further research is needed to clarify the long-term metabolic effects of artificial sweeteners.(10)

Pepino MY et al. article reviews experimental studies investigating the effects of non-nutritive sweeteners (NNS) on energy balance and glucose homeostasis. The authors analyze data from both animal and human studies that explore how NNS interact with sweet taste receptors in the gut, influence incretin hormone release, and alter glucose absorption. Methods include controlled trials assessing metabolic responses to NNS consumption under various conditions, such as fasting and postprandial states. Results from animal models suggest that NNS can activate gut sweet-taste receptors, modulate incretin release, and increase glucose transporter expression, potentially affecting glucose metabolism. However, human studies yield mixed findings, with many showing no significant incretin response to NNS in healthy, fasted individuals. The discrepancies highlight the complexity of translating animal data to humans and suggest that factors like dosage, species differences, and metabolic state influence outcomes. The authors conclude that further well-controlled human studies are needed to clarify whether NNS are metabolically inert or have meaningful effects on energy balance and glucose regulation. (11)

Thomson P et al. randomized, double-blind study investigated the short-term effects of high-dose sucralose consumption on glucose homeostasis and gut microbiome composition in

healthy male volunteers. Thirty-four subjects were divided into two groups: one received sucralose capsules (780 mg/day) for seven days (n=17), while the control group received a placebo (n=17). Before and after the intervention, glycemic and insulinemic responses were assessed using a standard 75 g oral glucose tolerance test, and insulin resistance was evaluated through HOMA-IR and Matsuda indexes. Gut microbiome composition was analyzed via 16S rRNA sequencing at baseline and post-intervention. The study found no significant changes in body weight, fasting glucose, insulin levels, glycemic or insulinemic responses, or insulin resistance markers after sucralose consumption compared to placebo. Microbiome analysis showed stable composition at the phylum level throughout the intervention, with dominant Firmicutes and Bacteroidetes populations remaining unchanged. However, when participants were classified by their insulin response, individuals with higher insulinemic responses exhibited a lower abundance of Bacteroidetes and higher Firmicutes, regardless of treatment. Overall, seven days of high-dose sucralose intake did not alter glucose control, insulin resistance, or gut microbiome in healthy men, highlighting the importance of considering individual metabolic variability in response to non-nutritive sweeteners.(12)

Tey SL et al. randomized crossover study investigated the effects of artificial and natural non-nutritive sweeteners (NNS) compared to sucrose on energy intake, blood glucose, and insulin responses in thirty healthy male participants. Each participant consumed four different beverages sweetened with aspartame, monk fruit, stevia, or sucrose on separate test days following a standardized breakfast. Energy intake was measured during an ad libitum lunch offered one hour after beverage consumption, and blood glucose and insulin levels were monitored every 15 to 30 minutes for three hours. Results showed that ad libitum lunch intake was significantly higher after NNS beverages than sucrose; however, total daily energy intake did not differ across treatments due to compensation at subsequent meals. Sucrose intake caused rapid spikes in glucose and insulin levels within the first hour, whereas NNS beverages led to smaller initial changes but higher post-lunch glucose and insulin responses. Despite these temporal differences, total glucose and insulin exposure over three hours did not differ significantly between treatments. The study concludes that calorie-free beverages sweetened with either artificial or natural NNS have minimal impact on total daily energy intake and postprandial glycemic and insulinemic responses compared to sucrose in healthy men.(13)

Santos NC et al. in a systematic review and meta-analysis evaluated the effects of aspartame consumption on metabolic parameters related to diabetes and obesity by analyzing randomized

controlled clinical trials. A comprehensive search was conducted across multiple databases and gray literature sources up to April 2016, resulting in 29 articles included in the qualitative synthesis and 12 studies with numeric data used in the meta-analysis. Key outcomes assessed were fasting blood glucose, insulin levels, total cholesterol, triglycerides, HDL cholesterol, body weight, and energy intake. The analysis showed that aspartame consumption did not significantly affect fasting blood glucose, insulin, total cholesterol, triglycerides, body weight, or energy intake when compared to control or sucrose groups. HDL cholesterol levels were slightly lower with aspartame compared to sucrose but marginally higher compared to controls. Overall, the data do not support any significant metabolic benefits from aspartame consumption in relation to diabetes and obesity risk factors.(14)

Bai X et al. systematic review and meta-analysis evaluated the effects of steviol glycosides (SGs) on glucose metabolism in adults by analyzing data from twelve randomized controlled trials with a total of 871 participants. The primary outcomes were changes in fasting blood glucose (FBG) and HbA1c levels from baseline to the end of the intervention. Using a random-effects meta-analysis, the study found that SGs significantly reduced FBG compared to controls, while no significant difference was observed in HbA1c levels. Subgroup analyses indicated that the beneficial effect on FBG was more pronounced in participants aged 50 or younger, those without diabetes or hypertension, and overweight or obese individuals. Despite these findings, the overall quality of evidence was rated low. The authors concluded that SGs may improve glucose metabolism in adults, but further high-quality research is needed to confirm these benefits.(15)

Kim Y et al.review examined the effects of non-nutritive sweeteners (NNS) on glycaemic control and the incidence of type 2 diabetes by analyzing evidence from epidemiological studies, human interventions, and animal research. While some findings suggest that NNS may influence the gut microbiome and interact with sweet taste receptors to modify the secretion of hormones such as GLP-1, PYY, ghrelin, and GIP, the overall impact of NNS on glycaemic control and diabetes risk remains unclear. The review highlights the need for long-term studies to better understand the role of NNS consumption in glucose metabolism and to draw more definitive conclusion. (16)

Pang MD et al. review discusses the impact of artificial sweeteners on body weight control and glucose homeostasis, highlighting that their metabolic effects vary due to differences in their chemical properties. The authors analyzed existing rodent studies and clinical trials in humans, noting that while many clinical studies report no significant or even beneficial effects of artificial sweeteners on weight and glycemic control, most of these studies were short-term. The review emphasizes that extrapolating results from one sweetener to all is inappropriate and points out the scarcity of long-term human research. It concludes that further well-controlled, long-duration studies are needed to clarify the effects of different artificial sweeteners on gut microbiota, body weight regulation, glucose metabolism, and their underlying mechanisms.(17)

Ahmad SY et al. review examined recent randomized clinical trials (RCTs) from 2017 to 2018 investigating the effects of nonnutritive sweeteners (NNSs) on glycaemic control. Most trials focused on artificial NNSs such as sucralose and aspartame, with only one study testing natural sweeteners like stevia and monk fruit extract. The majority of studies found no significant impact of NNS consumption on blood glucose, insulin, gastric inhibitory polypeptide (GIP), or glucagon-like peptide-1 (GLP-1) levels, although two trials reported that sucralose influenced the acute insulin response. The review concludes that current evidence is insufficient to determine which types of NNSs affect glycaemic control and highlights the need for further research addressing limitations in sample size, intervention duration, dosage, NNS forms, and participant demographics. Future studies should also compare different NNS types, including the growing use of natural sweeteners.(18)

Nichol AD et al. systematic review and meta-analysis evaluated the effects of nonnutritive sweeteners (NNSs) on blood glucose levels based on 29 randomized controlled trials involving 741 participants. The included studies assessed various NNSs such as aspartame, saccharin, steviosides, and sucralose, and their quality was evaluated according to PRISMA guidelines. Meta-analysis showed that NNS consumption did not lead to an increase in blood glucose levels; instead, glucose concentrations gradually decreased over time after intake. No significant differences were observed between types of NNSs, though individual responses varied depending on age, body weight, and diabetic status. The findings suggest that NNSs do not acutely raise blood glucose levels, but further long-term research is needed to understand the health implications of regular NNS use and the underlying biological mechanisms.(19)

Wiebe N et al. systematic review and network meta-analysis assessed the effectiveness of various sweeteners on metabolic outcomes in obese, diabetic, and healthy individuals using

Bayesian methods. A total of 53 randomized controlled trials with 1,126 participants were included from databases searched up to January 2011. Outcomes examined included weight change, energy intake, lipid levels, glycated hemoglobin, insulin resistance, and glycemic response. Results showed that in diabetic individuals, fructose significantly reduced 2-hour blood glucose levels compared to glucose. Non-caloric sweeteners were associated with a reduction in energy intake (by approximately 250–500 kcal/day) and a decrease in body mass index in short-term trials compared to sucrose. No consistent effects were observed on cholesterol levels. Despite the widespread use of non-caloric sweeteners, the review highlights a lack of high-quality clinical research and calls for further studies to evaluate their role in public health strategies targeting obesity and metabolic disorders.(20)

Suez J et al. study demonstrated that non-nutritive sweeteners (NNS), including saccharin, sucralose, and aspartame, may impair glucose metabolism by modifying the gut microbiota. Using both animal models and human participants, the researchers showed that mice consuming NNS developed glucose intolerance, which was not observed in control groups. Moreover, this effect was transferable: germ-free mice that received fecal microbiota transplants from NNS-treated mice also developed glucose intolerance, indicating a causative role of the altered microbiota. In the human component of the study, observational data revealed a correlation between long-term NNS consumption and dysbiosis as well as impaired glycaemic response. In a small clinical trial, healthy individuals who consumed saccharin daily for one week exhibited significant interindividual variability, with more than half showing worsened glucose tolerance and notable shifts in microbiota composition. These findings challenge the previously held assumption that NNS are metabolically inert, and suggest that their impact on the gut microbiome may have clinically relevant consequences for glucose homeostasis. (21)

Conclusion

Artificial sweeteners are widely used as sugar substitutes in an effort to reduce caloric intake and manage glycemic responses, particularly among individuals at risk for or living with metabolic disorders such as diabetes and obesity. While these compounds were initially considered metabolically inert, growing evidence indicates that their effects on glycemic control are more complex and may depend on factors such as the type of sweetener, individual metabolic status, gut microbiota composition, and concurrent dietary patterns.

Some artificial sweeteners, including aspartame and sucralose, have been associated with altered insulin sensitivity and changes in glucose metabolism, though findings remain inconsistent across studies. The potential modulation of the gut microbiome and incretin hormones offers plausible mechanisms for these effects, yet definitive conclusions are hindered by methodological limitations, variability in study design, and limited long-term human data.

Given the widespread consumption of artificial sweeteners and their presence in a broad range of processed foods and beverages, further high-quality, long-term clinical studies are needed to clarify their role in metabolic health. Until more conclusive evidence is available, a cautious and individualized approach to artificial sweetener use—especially among individuals with or at risk of glucose intolerance—is warranted.

Disclousure

Author's contribution

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