

Sweet without the sugar?

Artificial sweeteners

What are Sweeteners?

Sweeteners are substances that provide a sweet or 'sugary' taste when added to food, they may or may not provide energy, and are often used to enhance the flavor or texture of food. Apart from the more familiar natural sweetening agents or 'sugars' like granulated sugars, corn syrup, molasses and honey there are 3 general types sweeteners that are often used as additives to foods. These are:

- **Nutritive sweeteners** include natural sugars, syrups, molasses, honey but also sugar alcohols. Sugar alcohols are often produced commercially in large amounts. They are not really sugar but contain modified carbohydrates and are not calorie free. Examples of sugar alcohols include: Glycerol, Mannitol, Xylitol, Sorbitol, and Hydrogenated starch hydrolysates. Many products labeled "sugar-free" often have sugar alcohols as sweeteners.
- **High Intensity and Non-nutritive sweeteners** are low-calorie or non-caloric sweeteners, lacking vitamins and minerals, and therefore provide no nutritional benefit. They can also be natural or artificially made as follows:
 - **Natural sweeteners** formed from sweet chemical extracts from plants. The most common are Steviol glycosides or "Stevia" obtained from the leaves of the *Stevia rebaudiana* plant; and *Luo han guo* (monk fruit) or *Siraitia grosvenorii* Swingle (SGFE) fruit extracts. These sweeteners are 100-400 times sweeter than table sugar but contain no calories and are used in flavoured waters and soft drinks.
 - **Artificial chemical sweeteners** for example: Aspartame (NutraSweet® and Equal®), Saccharin (Sweet'N Low®) and Sucralose (Splenda®).



Common artificial sweeteners

There are 6 artificial, non-nutritive sweeteners currently approved by the United States Food and Drug Administration (USFDA) as food additives¹.

Sweetener	Sweetness compared to sugar	Uses
Aspartame	200 times sweeter than table sugar	table top sweetener on cereals, chewing gum and beverages, instant coffee and tea, gelatins, puddings, dairy products and toppings
Acesulphame Potassium/ Acesulfame K/ Ace-K	200 times sweeter than table sugar	low calorie frozen desserts, candies, beverages and baked goods
Saccharin	up to 700 times sweeter than table sugar	beverages, fruit drinks; for cooking or table use and in processed foods
Sucralose	600 times sweeter than table sugar	variety of foods, pastries, beverages, chewing gum, gelatins, frozen dairy desserts
Advantame	up to 13,000 times sweeter than table sugar	general purpose sweetener and flavour enhancer in foods and baked goods
Neotame	20,000 times sweeter than table sugar	general purpose sweetener and flavour enhancer in foods and baked goods.

How to identify artificial sweeteners in food and beverages

Although some artificial sweeteners are approved for use there is growing concern about the effect on obesity and Type 2 Diabetes Mellitus and other harmful effects. Many foods and beverages contain artificial sweeteners and may be marketed/labelled as 'diet', 'zero sugar', 'no sugar' or 'low calorie'. It is therefore important to identify their presence in a food/beverage. Because they lack calories, vitamins or minerals, these are identified in the ingredient lists on food labels by their scientific name, or brand name.

“The evidence is out” on Artificial Sweeteners

There is conflicting research evidence about the short and long-term health consequences and benefits of artificial sweeteners. There is no global consensus on this issue, and new science is continually emerging. However,

- Artificial sweeteners can influence taste preferences, causing a preference for sweet foods by making naturally sweetened foods less appealing and altering feelings of hunger and fullness².
- Youths who reported high consumption of beverages with low calorie sweeteners had lower overall diet quality which was an indicator of an unhealthy lifestyle associated with higher than normal blood glucose, total cholesterol, and high cardiovascular risk³.
- Studies have shown an increase in short term food intake and appetite^{4,5}, increased body weight which may lead to obesity⁶, increased risk of developing type 2 diabetes^{7,8} and association with some cancers.^{7,9}
- Other studies with contradictory findings, report no effect on food intake or fullness, a decreased effect on food intake and appetite,^{10,11} support for weight loss and management^{12,8}, reduced risk of type 2 diabetes⁹ and hypertension⁸ and no association with cancer¹³.
- Replacing sugar sweetened beverages (SSBs) with low calorie beverages containing artificial sweeteners has been shown to reduce the intake of calories for supporting weight management and lower the risk of developing chronic noncommunicable diseases. However, replacing SSBs with water or low-fat beverages such as milk is associated with even lower risk of type 2 diabetes.

The health effects and risks are still unknown and there is a need for further research on the effects of sweeteners on energy balance, cardiometabolic risk factors, and risk of CVD and other chronic diseases.



Recommended Guidelines for using artificial sweeteners

- Maintain a balanced diet to support weight loss by not increasing calorie intake from other sources e.g. diet high in fat and although foods containing artificial sweeteners may be low in sugar, check the label if the content of other nutrients such as fat is high.
- Drink water instead of hydrating with beverages containing artificial or natural sweeteners.

Recommendations for children

- In the absence of strong clinical evidence with respect to artificial sweeteners use and adverse health outcomes¹⁴ children should limit their consumption of artificial sweeteners.
- Recommended low/no calorie beverage alternatives are drinking water, eating whole fruits and refreshing with other alternatives such as unsweetened milk.
- The Ministry of Health and Wellness of Jamaica’s Interim Guidelines for Beverages in Schools states: “The use of artificial sweeteners is discouraged; their use should be guided by the Food and Drug Regulations, 1975 and its relevant amendments as well as the list of approved sweeteners published by the US Food and Drug Administration, which the Ministry of Health has adopted”.¹⁵
- The American Heart Association has advised against prolonged consumption of low-calorie sweetened beverages by children.¹⁶

¹ United States Food and Drug Administration.(2014) High Intensity Sweeteners. Retrieved from <https://www.fda.gov/food/food-additives-petitions/high-intensity-sweeteners>

² Low, Y.Q., Lacy, K. and Keast, R. (2014) The Role of Sweet Taste in Satiation and Satiety. *Nutrients*; 6: 6431-3450. Doi: 10.3390/nu6093431.

³ Bortsov AV., Liese A.D., Bell R.A. Dabelea D., D’Agostino R.B. Jr., Hamman RF., Klingensmith G.J., Lawrence JM, Maahs DM, McKeown R., Marcovina SM, Thomas J., Williams DE, Mayer-Davis E.J., (2011) Sugar-sweetened and diet beverage consumption is associated with cardiovascular risk factor profile in youth with type 1 diabetes. *Acta Diabetologica*. 48: 275-282. Doi: 10.1007/s00592-010-0246-9

⁴ Gadah, N.S., Brunstorm, J.M., Rogers, P.J. (2016) Cross-over studies underestimate energy compensation: the example of sucrose versus sucralose containing drinks. *Appetite*, 107: 398 – 405.

⁵ Reid, A.E., Chauhan, B.F., Rabbani, R., Lys, J., Copsstein, L., Mann, A., Abou-Setta, A.M., Fiander, M., Mackay, D.S., McGavock, J., et. al. (2016) Early exposure to nonnutritive sweeteners and long term metabolic health: a systematic review. *Pediatrics*; 137.

⁶ Azad, M.B. Adou-Setta AM., Chauhan BF, Rabbani R., Lys, J, Copstein L., Mann A. Jeyaraman MM, Reid AE., Fiander M., Mackay DS., McGoavock J., Wicklow B., Zarychanski R., (2017) Nonnutritive sweeteners and cardiometabolic health: a systematic review and meta-analysis of randomized controlled trials and prospective cohort studies. *Canadian Medical Association Journal*; 189: E929-E939. Doi: 10.1503/cmaj.161390.

⁷ Pan, A., Malik, V. S., Schulze M.B., Manson, J.E., Willett W.C., Hu, F.B., (2012) Plain-water intake and risk of type 2 diabetes in young and middle aged women. *American Journal of Clinical Nutrition*. 95: 1454-1460. Doi: 10.3945/ajcn.111.032698

⁸ Imamura, F., O’Connor L., Ye, Z., Mursu, J., Hayashino, Y., Bhupathiraju, S.N., Forouhi, N.G., (2015) Consumption of sugar sweetened beverages, artificially sweetened beverages and fruit juice and incidence of type 2 diabetes: systematic review, meta-analysis and estimation of population attributable fraction. *British Medical Journal*. 351:h3576. doi: 10.1136/bmj.h3576.

⁹ Berry, C., Brusick, D., Cohen, S.M., Hardisty, J.F., Grotz, V.L., Williams, G.M. (2016) Sucralose non-carcinogenicity: a review of the scientific and regulatory rationale. *Nutrition and Cancer*; 68: 1247 – 1261

¹⁰ Turner-McGrievy, G., Wang, X., Popkin, B. & Tate, D.F. (2016). Tasting profile affects absorption of caloric beverage reduction in a randomized weight loss intervention. *Obesity Science and Practice*. 2: 392- 398

¹¹ Pereira, M.A., (2013) Diet beverages and the risk of obesity, diabetes and cardiovascular disease: a review of the evidence. *Nutrition Review*. 71: 433 – 440. Doi: 10.1111/nure.12038.

¹² Fowler, S.P., Williams, K., Hazuda, H.P. (2015) Diet soda intake is associated with long term increases in waist circumference in a biethnic cohort of older adults: The San Antonio longitudinal study of aging. *Journal of the American Geriatrics Society*; 63: 708 -715.

¹³ Mishra, A., Ahmed, K., Froghi, S., Dasgupta, P. (2015) Systematic review of the relationship between artificial sweetener consumption and cancer in humans: analysis of 599,741 participants. *International Journal of Clinical Practice*. 69: 1418 – 1426.

¹⁴ Brown R. J., de Banate, M.A., Rother, K.I., (2010) Artificial sweeteners: a systematic review of metabolic effects in youth. *International Journal of Pediatric Obesity*; 5: 305 - 12

¹⁵ Ministry of Health / Ministry of Education Youth & Information. (2018) Interim Guidelines for Beverages in Schools

¹⁶ Johnson RK, Lichtenstein AH, Anderson CAM, Carson JA, Després J-P, Hu FB, Kris-Etherton PM, Otten JJ, Towfighi A, Wylie-Rosett J.; (2018) Low-calorie sweetened beverages and cardiometabolic health: a science advisory from the American Heart Association. *Circulation*. 138:e126–e140. doi: 10.1161/CIR.0000000000000569