Sugars

Sugars are common components of our diets. They are found in a wide range of foods and drinks, both naturally and in added form, including in fruit and fruit juices, milk and dairy products, honey, jams and marmalades, soft drinks, ready-meals, vegetable products (e.g. tomato ketchup), desserts, and other sweet treats. Sugars provide a sweet, pleasant taste to our foods and are the most basic source of energy for our bodies. With the increase in added sugar consumption over the last decades, alongside the rise of obesity and related illnesses, the role of sugar in our health has been questioned. This article provides answers to some widespread questions on the link between sugars and health, drawing on the latest scientific evidence.

What exactly is sugar?

Sugars are the building blocks of all carbohydrates and can be classified into monosaccharides, disaccharides, oligosaccharides and poly-saccharides:

- Monosaccharides are one-unit-only sugars like glucose, fructose and galactose
- Disaccharides consist of a combination of two individual one-unit-only sugars to form table sugar (sucrose) or milk sugar (lactose)
- Oligosaccharides are medium chains of single unit sugars and include mannose and fibres such as short-chain inulin
- Poly-saccharides are long single-unit sugar chains and include starches like those found in potatoes, onions and carrots

Sucrose is the sugar combination which is commonly referred to as 'table sugar'. Other uses of the term 'sugar' may more generally refer to monosaccharides and disaccharides. You can find an overview of the different types of sugars in our article on 'The functions of carbohydrates in our body'.

Are naturally occurring sugars healthier than added sugars?

No, sugars – whether they occur naturally or are added to foods – are chemically the same and have the same effect on our bodies.

Sugars are sometimes categorised as 'natural', 'total', 'free', or 'added'[1], which may lead us to think that sugars themselves could be 'healthier' or not, which is technically incorrect. However, foods in which sugars naturally occur – be it grains, pulses, fruit or vegetables – usually contain fibres and other nutrients alongside sugars, and as such are better for our health than foods containing predominantly free or added sugars. Indeed, a high intake of free and added sugars is a risk factor for many preventable diseases, whereas natural sugars from a diet rich in wholegrains, fruit and vegetables are of no concern[2,3].

Is sugar in fruit bad?

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No, sugars in fruit are not bad. Fruit contain sugars alongside other nutrients such as vitamins, minerals and fibre, meaning in addition to the sugar itself, which is important in our body's energy metabolism, you receive additional health benefits through consuming fruit rather than fruit sugars by themselves.

The main sugar occurring in fruit is fructose and there was some concern a few years ago about its health effects on our bodies (see also our article on 'What is fructose and is it bad for you?'). However, scientific research shows that there is currently little evidence that fructose itself causes health problems – not in the amounts eaten within a general European diet, particularly as part of whole fruits[4–6].

What is the healthiest alternative to sugar?

No type of sugar is healthier than another, as the way sugar is used by the body is similar and always amounts to approximately four calories of energy per gram. For many of us, the 'healthiest alternative' is to reduce sugar consumption to the recommended levels by the World Health Organization. A reduction of sugars in the diet can be achieved step-by-step by reducing the amount of sugar used in home-cooked or home-baked recipes as well as store-bought products, whilst still achieving a satisfactory sweetness (and fullness) in the recipe.

Can sugars cause overweight and obesity?

Yes, sugars, like other calorie-containing nutrients, can contribute to overweight and obesity[7–9]. Foods high in sugars are sweet, which makes them very attractive to the brain. Hence, managing sweetness in our diet may require special vigilance. Paying attention to portion size and energy content of our foods and soft drinks, will ensure that daily calories do not exceed our energy requirements.

Does sugar cause diabetes?

Possibly. Evidence from research shows that a high consumption of soft drinks can increase the risk of type 2 diabetes[8,10]. However, the evidence on free and total sugars in a balanced diet causing type 2 diabetes is at the moment inconclusive [7,11,12]. Further, the scientific community agrees that naturally occurring sugars in fruit and vegetables, grains and pulses are of no concern in the development of diabetes, and these foods are considered to contribute towards the disease's prevention instead.

Can sugar make children hyperactive?

No. Many parents believe that too much sugar can contribute to their children's hyperactivity, but this relationship is not supported by the scientific evidence. This belief stems from case studies in the 1970s and the claim that sugar is the cause of attention deficit hyperactivity disorder (ADHD). But these early studies were methodologically flawed, and the link between sugar intake and activity may be the result of 'reverse-causality' - more active children need more energy and therefore have higher sugar intakes. The majority of controlled experimental studies since then do not support the notion that sugar intake leads to an increase in activity[13,14].
The perceived association could also be influenced by parental beliefs and expectations. In one study, the parents who were told their child was given a drink containing sugar rated their child's behaviour as more hyperactive; even though all drinks were sugar-free[15].

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In context of ADHD, it is now clear that the causes of ADHD are multifactorial and include both genetic and environmental factors. There is no conclusive evidence that sugar is one of the factors that contribute to the development of ADHD[13,14].

Can sugars damage your teeth?

Yes, sugar is the cause of dental caries. Free sugars in the diet are fermented by naturally occurring bacteria in the mouth, and the resulting waste products are causing tooth decay[16]. Reducing free sugars in the diet to less than 5% of total energy intake as recommended by the World Health Organization (WHO) and good oral hygiene practices involving the use of fluoridated toothpaste can prevent the onset of dental caries, as they reduce bacterial waste products and support tooth enamel[16,17].

Is sugar addictive?

No. There is currently no evidence that sugar is addictive in humans. Addiction is a physiological and psychological process which causes dependence and withdrawal symptoms if the addictive substance is no longer taken. Although research in rodents has shown that rats under specific conditions develop addiction-like responses to sweet-tasting substances, these observations have not been conclusively confirmed in humans[18–20]. In the animal experiments, rats had food withheld from them and were only given sugar solutions at specific times in the day rather than allowing them to feed according to their natural rhythm.
The theory of sugar addiction has been suggested by drawing parallels to other addictive behaviours[21], yet scientific research to date has not found any convincing behavioural or neurobiological indicators that resemble addiction to sugar[19] in normal weight or in overweight individuals.
In general, scientists have yet to agree whether food addiction exists[20]. Tools to measure food addictions such as the Yale Food Addiction Scale have so far not fully received a stamp of approval[22].
Scientists agree that it is important to make a difference between[20,23]:

- people with a strong craving for food
- the idea that specific foods or nutrients are themselves addictive
- the behaviour of eating in itself being addictive

It is likely that the food environment plays an important role for the people who overeat[24]. The high availability of food and drinks that are tasty, together with a social environment that favours large portion sizes, can encourage overeating. This environment may be particularly challenging for people who tend to binge eat and who show a strong desire for sweet or fatty foods[19,20].

Is sugar toxic to the human body?

No, sugar is not toxic to the body. Toxicity implies that a substance causes irreparable damage to the body. Sugar is an essential nutrient from which the body directly receives energy. However, the body can digest some starches into sugars and use them as an energy source that achieves much more stable blood sugar levels. In addition, fibre-rich foods (see our article on dietary fibre) offer added health benefits as they are often rich in other nutrients like vitamins and minerals. Hence, it is recommended to replace simple sugars with wholegrain and other fibre-rich products.

How much sugar is OK in a day?

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The WHO suggest that free sugars (which means all monosaccharides and disaccharides added to foods by the manufacturers, cooks, or during cooking at home, plus sugars naturally present in honey, syrups and fruit juices) make up no more than 10% of a person's daily energy intake[16,17]. For an adult requiring 2000 kcal a day, 10% equates to no more than 200 kcal from free sugars, which is about 50 grams or 12 teaspoons of sugar.
Information on what people eat on a daily basis (including sugar-containing foods) and culture-specific diets are considered when developing dietary goals and country-specific food-based dietary guidelines (FBDGs). Overall, FBDGs suggest that sugar-containing foods should be the smallest proportion of a healthy diet, at the top of a food pyramid (see our article on 'Food-based dietary guidelines in Europe').

Conclusion

Taken together, current scientific evidence does support direct, context-specific causal links between sugars and obesity as well as dental health. There is no evidence that sugars are addictive in humans, or cause hyperactivity in children.

As a common part of our diet, sugars contribute energy to our body, but they also make our foods more attractive. Just like with any other macronutrient, consuming sugar in excess can have a negative impact on weight and health. When eaten in moderation, however, so that an overall balanced diet is achieved, sugar can be enjoyed as part of a healthful lifestyle.

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They Also Provide Stored Energy explain your findings

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They Promote Digestive Health How?

Explain how They Influence Heart Health and Diabetes

Are Carbohydrates Necessary for These Functions?

How Are Carbohydrates Digested?

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What Medical conditions that affect how carbohydrates are digested

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