



Comité Européen  
des Fabricants de Sucre

# A Propos Sugar

Sucrose ■ Saccharose

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## Editorial

The publication of a review article, a synopsis... it is on the basis of their respective contents that Apropos Sugar proposes to look at three subjects in the field of “Sugar and Health”: the place of sugar in the nutritional status, consumption of sugar(s) and the epidemiology of obesity and the choice of sugars for improved performances.

Three subjects, three questions:

- Is sugar responsible for diluting the nutrient quality of the diet? sugars and empty calories, a criticism regularly levelled at sugars and presented as a scientific reality. A recent review of the literature questions the reality of the dilution of micronutrients linked to the consumption of sugars and the justification for recommended intakes of sugars that are fixed with a view to preserving the micronutrient status.
- What do observational studies have to tell us about the question of sugar(s) and weight? epidemiological data in the literature concerning sugars and the weight of populations are reviewed.
- Which sugars for improved performances? Or how to learn more about the carbohydrates which, by protecting glycogen stores, are likely to delay the onset of fatigue during prolonged exercise. The results of studies comparing the influence of various simple sugars on performance are presented here.

## ■ Does sugar dilute the nutrient quality of the diet?

One of the more persistent beliefs about sugar is that it displaces vitamins and minerals from the diet. After all, it is argued, sugar is only calories: it contains no vitamins or minerals. So, obviously, any sugar in the diet must be at the expense of more useful foods that contain vitamins or minerals.

So, it comes as a surprise to many people, even experts in nutrition, to find repeated attempts to confirm this prejudice have failed to do so. Study after study has found that people who consume more sugar than average are just as likely to get enough of the essential vitamins and minerals (collectively called “micronutrients”) as people

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who avoid sugar. Certainly some people, including some children, do not seem to be consuming enough of a few of these micronutrients, but the amount of sugar they eat has virtually no relevance. The people who go short are those that either do not eat enough overall (if you do not eat you cannot take in the nutrients you need) or have strangely limited diets. It is what you do *not* eat that determines your risk of micronutrient deficiency, not whether you have a sweet tooth. Surprisingly, most people who have enough to eat generally

manage to include enough of all the micronutrients they need without thinking about their diets at all.

Indeed, sugar in the diet actually helps to make a wide variety of foods palatable, and it is variety that is the key to a healthy diet. Even among very young children, the amount of sugar they have in foods and drinks has been found

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to have virtually no influence on their micronutrient intake. This is surprising, since they tend to prefer more sugar than adults and have a smaller intake of food overall. So if anyone should show the expected shortfall in micronutrient intake it should be young children. In fact, most young children have adequate intakes of micronutrients, irrespective of their sugar intake. A few children who have a very high proportion of their food calories as sugar have a slightly lower micronutrient intake than those with average intakes of sugar. But this has little or nothing to do with how much sugar they prefer. It seems to be an illustration of a general rule that anyone who has an abnormally large proportion of their diet from one nutrient is likely to have an unbalanced diet that lacks something else. Those people with abnormally *low* intakes

of sugar are just as likely to have low micronutrient intakes.

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Sugar in the diet has a number of useful benefits that are often forgotten. In the first place, sugar is a carbohydrate, and therefore a useful part of this important contributor to a healthy diet. A second benefit is that people who eat more sugar tend to eat less fat. Since fat has the most important influence on body weight of all the nutrients, a lower fat intake usually means a lower risk of obesity. And lastly, sugar helps to make many useful foods palatable that would otherwise be avoided, especially by children. It is this last benefit that probably accounts for the fact that people who eat more sugar than average rarely have inadequate micronutrient levels.

Eating too much of anything will lead to an unbalanced diet. But the evidence is clear that normal intakes of sugar have no appreciable adverse effects on the quality of the overall diet – and some benefits.

R. C.

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## ■ Exploring the relationship between sugars and body weight: a review of epidemiological data

It is often suggested that high consumption of sugars should be avoided due to links with obesity. However there is a substantial body of epidemiological evidence refuting this claim. As early as the 1970's, a study with 415 British businessmen showed that those who made particular efforts to limit their sugar consumption were more likely to be overweight (Richardson, 1972). Since then, many nationally representative and large population studies have examined the relationship between dietary intakes and body weight status in adults and children.

### Relation between intake of carbohydrates and sugars and body weight

The main observation from these epidemiological studies which analysed associations between body mass index (BMI) and dietary carbohydrate and sugars intake have found an inverse association, or no association (Hill and Prentice, 1995; Schneider and Heseke, 1999; Parnell et al., 2007). The negative correlation between total sugar intake and BMI has been consistently reported for children and adults (IOM, 2002) throughout all age groups, and in general, does not depend on the form in which the sugar is consumed e.g. as a drink or in food.

Dietary surveys such as the Scottish Heart Health Study (SHHS), the first Scottish MONICA study of the WHO (MONICA: monitoring trends and determinants in cardiovascular disease) and others have observed that the higher the consumption of sugar, the lower the prevalence of overweight and obesity (Bolton-Smith and Woodward, 1994), and the lower the consumption of fat. Conversely higher

fat consumption was accompanied by a higher occurrence of overweight and obesity.

The most recent analysis in the relationship between sugars and obesity was reported by Parnell et al. (2007). They confirmed that overweight or obese adults did not have higher intakes of sugars or sucrose than normal weight adults. Obese children consumed significantly less sugars than overweight or normal weight children. Furthermore there was no significant relationship between sucrose and % energy from sucrose (sugar) from beverages and weight status for either adults or children.

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### Sugar and body weight management

A diet that contains a higher proportion of carbohydrate and less fat will be more likely to assist weight control than a diet that is high in fat and lower in carbohydrate (Astrup et al., 2000). Saris et al. (2000) found, in a 6-month dietary intervention study with over 400 participants, that carbohydrate-rich, low-fat diets with varying sugar content were favourable for long-term weight management. The sugars content of the diets was irrelevant. Furthermore, it was observed that a lower fat content of the diet, lead to a lower energy density, independent of the sugar content. The weight losses achieved under these free-living condi-

Overweight or obese adults did not have higher intakes of sugars or sucrose than normal weight adults.

tions, where the participants could eat to satisfy their appetite, demonstrate that a higher sugar content in the diet does not lead to increased hunger or higher energy consumption.

In conclusion, observational studies consistently reported a negative correlation between sugar intake and indices of obesity. Low-fat, high carbohydrate diets have been recommended for weight control, but finally the balance between calories consumed and energy expended is important in weight management.

S. Z.

Higher sugar content in the diet does not lead to increased hunger or higher energy consumption.

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## ■ The role of sugar in physical activity and exercise

During prolonged exercise, the fuel reserves of the body are mobilized to provide energy for muscular contraction. Carbohydrates are the primary muscular fuel that is metabolized and is the preferred energy source for muscles making up to 60-70 % of total energy expenditure during activity of moderate or high intensity.

Limited amounts of carbohydrates are stored as glycogen in the muscles and in the liver. During exercise, this muscle glycogen is utilized. It is important to replenish the glycogen stores before, during and after physical activity, especially for long-duration physical activity of moderate or high intensity. It is most beneficial to consume high glycaemic and medium glycaemic index carbohydrates, immediately after physical activity, when glycogen synthesis is at its highest level.

**Previously it was believed that foods with a low glycaemic index were better at increasing glycogen stores, than foods that stimulated a high blood glucose response, but this has not been confirmed** (Walton, 1997). Carbohydrates with a high glycaemic and medium glycaemic index (e.g. glucose, sucrose, and starch with high amylopectin content) are more efficiently stored as glycogen than other carbohydrates with a low glycaemic index. Feedings glucose, sucrose or glucose polymers before and during endurance exercise will elevate and maintain blood glucose, enhance carbohydrate oxidation, improve endurance performance and delay the onset of fatigue (Sherman, 1995).

**According to Jeukendrup and Jentjens (2000), some types of carbohydrates from a single source are oxidized more readily than others.** These single-source carbohydrates can be classified into those (e.g. glucose, sucrose, maltose, maltodextrins, amylopectin) which are oxidized at high rates (up to 1 g/min) and in those (e.g. fructose, galactose, isomaltulose, trehalose, amylose) that are oxidized at low rates (up to 0.6 g/min). These differences seem to be linked to the digestion and absorption rates of these carbohydrates, which affect also their rate of oxidation.

**Achten et al. (2007) compared metabolic and oxidation profiles following ingestion of a rapidly oxidized carbohydrate (sucrose) and a slowly oxidized carbohydrate (low GI)** in ten young moderately trained men during a 150 min period of cycling. Total carbohydrate and exogenous carbohydrate oxidation was higher following sucrose ingestion compared to the low GI carbohydrate. Sucrose had a significant endogenous carbohydrate sparing effect. With the lower GI carbo-

hydrate however the oxidation rates were only 59 % of the oxidation rates on the ingested sucrose, presumably because of a lower rate of digestion, plus there was no significant endogenous carbohydrate sparing. **Under these conditions of physical exercise, sucrose had a more beneficial effect on the glycogen stores (a glycogen sparing effect), than a low GI carbohydrate.**

In conclusion, the provision of rapidly available carbohydrate e.g. sucrose during prolonged exercise can protect the endogenous glycogen stores from depletion and thereby delay the onset of fatigue.

S. Z.

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