

REVIEW OF FREE SUGARS

By Sallyanne Pisk

Introduction

The aim of this paper is to address current health and environmental issues related to the consumption of free sugars that may be of relevance to products sold by the Blue Mountains Food Co-operative. The paper addresses 'free' sugars only. The review does not include food sources of carbohydrate or non-sugar based sweeteners.

"Free sugars include monosaccharides and disaccharides added to food and beverages by the manufacture, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates" WHO 2015

- Monosaccharides (mono meaning one) consist of a single unit of sugar, for example glucose, galactose or fructose.
- Oligosaccharides (oligos meaning few) consist of at least two sugars (disaccharides), such as sucrose or cane sugar, which is made from one unit of fructose and one of glucose. Well known disaccharides include lactose (glucose and galactose), which is only found in milk and maltose (two units of glucose) found in potatoes, cereal products and malt.
- Polysaccharides are made from hundreds or thousands of monosaccharide units. In plants, cellulose and starch are the most abundant polysaccharides.

1.0 What are the health issues related to sugar intake?

1.1 Sugar and health

Free sugar is a refined source of carbohydrate. Carbohydrate is the main source of energy for the body, with glucose being the only fuel supply for our brain. The type of carbohydrate and the presence of other nutrients, such as fat and protein and fibre, in foods affect how our body digests and utilises sugar. Not all sugars are equal in this regard.

The digestion and metabolism of carbohydrate has been a focus of research for body weight and the prevention and management of chronic disease such as diabetes. One significant finding has been the glycemic index. This system rates how quickly a carbohydrate is digested and absorbed as sugar (glucose) into our blood stream. The glycemic index is discussed in more detail below.

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Research into free sugar's impact on health has focussed on dental health and body weight. The World Health Organisation (WHO) released their expert sugar guidelines in early March 2015. The guidelines recommend that adults and children reduce their daily intake of free sugars to less than 10% of their total energy intake. They also suggest a further reduction to below 5% or roughly 25grams per day. The recommendations are based on research concerning body weight and dental health, respectively.

The research evidence to reduce free sugars to less than 10% total energy consumption is considered moderately strong, where as evidence to reduce to 5% total energy consumption is considered low. The strength of scientific evidence is related to the type and quality of research that has been conducted. This detail can be accessed in the [WHO 2015 guidelines](#).

It should be noted that nutrition research has moved on from focussing on single foods or nutrients, to assessing dietary patterns. Dietary patterns, such as the Mediterranean Diet, better assess how people eat, and how the different combinations of foods influence the prevention and management of chronic lifestyle related diseases such as heart disease and type 2 diabetes.

Of particular concern in Australia is the low intake of fruit and vegetables. In 2014–2015, only 49.8% of Australian adults were eating the recommended 2 serves of fruit per day, and only 7% were eating the recommended 5 or more serves of vegetables (ABS 2015). The 2011–12 Australian Health Survey showed that teenagers obtained close to 41% of their kilojoule intake from discretionary foods, and adults about 36% (ABS 2014). Discretionary foods are described as those low in nutrient value, high in added sugar, fat and salt, and high in kilojoules.

1.2 What do the sugar guidelines mean?

The average energy intake of an adult in Australia is 8,700kJ per day (1995 NNS). Based on the WHO 2015 guideline, this equates to 12 teaspoons (10% energy) or 6 teaspoons (5% energy) of free sugars per day. A teaspoon of sugar is about 4g in weight and provides 70 kilojoules (19 calories).

1.3 Glycemic Index

The glycemic index (GI) ranks a food containing carbohydrate according to how quickly blood glucose levels rise after eating that food. The GI system allocates a ranking of 0–100 to foods. A high GI food is ranked 70 or more, a medium GI is 56–69 and a low GI is 55 or less. Food examples can be found by searching the University of Sydney [GI research library](#).

Including foods with a low GI in your regular eating pattern has several health benefits through reducing body fat and maintaining a healthier body weight, and lowering the risk of developing type 2 diabetes, diabetes complications and heart disease.

The GI is not a ranking system for overall nutritional quality of foods. A highly processed, high glucose food or drink can have a low or medium GI, but is devoid of fibre, vitamins, minerals and phytonutrients (including antioxidants). These have essential roles in maintaining good health and preventing lifestyle related diseases, such as heart disease and diabetes.

To get the full benefit from using the GI system, eat mostly wholefoods with low to medium GIs. The GI symbol has been developed to assist in the selection of processed foods that also meet nutritional guidelines for key nutrients such as saturated fat, fibre and added sugar. This appears on foods that have met the required nutritional standards.

2.0 Finding added sugars in food

We can measure the free sugars that we add to our own food, but how do we identify it in processed and packaged foods? Some food may be promoted as “no added sugar”, but discussion might be required concerning the interpretation of this. Food labels provide information about the sugar content of packaged foods. When eating out, it is not possible to assess the free sugar content of the food unless we access the recipes used, but we can certainly ask about sources of added sugar.

2.1 Food labels

The ingredients list on a food label informs whether free sugars have been added to the product. Ingredients are listed in descending order (highest to lowest). The sugar content listed in the nutrition panel provides the total sugar content for the product. It does not differentiate between naturally occurring and added sugar. For example your product might be a fruit muffin, so sugar will naturally come from the fruit and flour, but it may also contain added sugar.

Other claims: if your product doesn't contain added sugar it may state “no added sugar”.

How do we use the food label information?

- If the ingredients list on a food label doesn't include sugar then you can feel confident that the only sugar present in the food is from natural sources.
- If sugar is listed, remember if it is at the start of the list it is a major ingredient.
- The amount of sugar listed in the nutrition information panel provides a total amount of sugar present in the food per serve size and per 100g. If there is more than 15g of sugar per 100g of food, then the product might have added sugar, so check the ingredients list for sources of added sugar.
- Use the 100g amounts to compare products, and when referring to the amount per serve consider whether you eat the suggested serve size, more or less.

[Choice Magazine](#) is currently running a campaign to raise support for transparent sugar labelling guidelines. They are lobbying for both natural and added sugars to be quantified on the label.

2.2 Sugary facts

- 600ml bottle of sweetened soft drink contains 15 to 16 teaspoons of free sugars.
- 200ml carton of fruit juice contains about 5 teaspoons of free sugars.
- 200ml chocolate flavoured milk contains 2 to 3 teaspoons of free sugars.
- 200g of sweetened non-fruit yoghurt contains 2 to 3 teaspoons of free sugars.

3.0 What are the current misconceptions about sugar?

3.1 Fructose

There is a current trend to reduce all sugar intake, especially fructose, regardless of the source. Fructose is digested and metabolised via different pathways to glucose; this difference was speculated as causing weight gain and conditions such as fatty liver. The current status in the scientific literature is that the consumption of all free sugars needs to be reduced.

Additional confusion has been created by the use of high fructose corn syrup (HFCS), which is neither high in fructose or a corn syrup. It is also a very different sweetener to fructose. HFCS is a highly processed sweetener that relies on commercial enzymatic processes to convert maize into glucose-rich corn syrup, then a second stage of enzymatic processes to convert the corn syrup into fructose syrups. HFCS are used extensively in America to sweeten soft drinks.

Reports about fructose have led to people avoiding fruit and using rice malt syrup, which doesn't contain fructose. Rice malt syrup is not a desirable choice due to its high GI, as tabled below.

In 2016, in Australia, there were reported cases of scurvy (vitamin C deficiency), due to people avoiding fruit. See recommendations for fruit intake below.

3.2 Carbohydrate

The current evidence-based guidelines for the consumption of carbohydrate-containing foods are outlined in the Australian Guide to Healthy Eating. This document recommends that an average Australian adult eat:

- 3 or more serves of whole grains per day (depends of level of activity)
- 2 or more serves of pulses per week (vegetarians to eat daily)
- 2 to 4 serves of dairy or equivalent per day
- 2 serves of fruit daily
- 5 serves for more of vegetables a day

These foods also supply a wide range of vitamins, minerals, phytonutrients, such as antioxidants, protein, fat and fibre. The less processed or refined a food is, the more nutrients the food will contain.

More information on guidelines at www.eatforhealth.gov.au

4.0 How is sugar produced in Australia?

4.1 The sugar industry

Australia is one of 100 countries producing sugar. About 70% of the sugar worldwide is produced from sugar cane and the remaining 30% from sugarbeet. Australia's sugar is produced from sugar cane, from mostly Australian family-owned and operated farms, along the east coast from Grafton, New South Wales (NSW), to Mossman in far north Queensland (QLD). Australia is the second largest exporter of sugar after Brazil (Cane Growers).

Statistics provided by Sugar Australia:

- Sugar is the second largest export crop in Australia after wheat
- Australia exports about 80% of the raw sugar produced
- The Australian annual domestic market for raw sugar is about one million tonnes

4.2 Production process

1. Planting of cane stalks called 'setts'. These stalks are about 40cm long.
2. Growing time in Qld is 9–16 months and in NSW, 18–24 months. Mature cane is 2–4 metres tall.
3. Mechanical harvesting cuts the stalk at the bottom of the cane. It is then cut into 30cm lengths called 'billets'. The billets are collected by a cane haulout. To minimise the evaporation of sugar cane juice, harvested cane needs to reach the mill within 16 hours of being cut.
4. Milling involves shredding to expel the juice and rolling to separate the juice from the fibrous material, called 'bagasse'. Bagasse is used as fuel for the mill's furnaces.
5. The juice passes through a purification process before being concentrated by boiling in an evaporator. The process of concentration continues until sugar crystals form (crystallisation). The syrup and crystals are separated in centrifuges. Molasses is the syrup left over from the final centrifuging. The raw sugar produced is either exported or stored for refining. The sugar is still not suitable for human consumption.
6. The refining process starts by (i) heating the raw sugar in syrup to soften the outer layer of the crystals. (ii) The crystals are then separated in a centrifuge and dissolved in hot water to form a sugar liquor. (iii) Purification of the sugar liquor involves carbonation (addition of carbon dioxide) or phosphatation (addition of phosphoric acid and lime), which results in crystal clear liquid. (iv) The resulting liquid is refined further before being seeded with fine sugar crystal, which are grown the required size. The mixture of the crystals and syrup is called 'massecuite'. (v) The crystals are separated from the syrup via a centrifuge and then reboiled. This step occurs a number of times. (vi) The refined sugar crystals are dried by air in a tumbler.
7. The sugar is graded by the size of the crystals.

You can read more about the milling process on the Australian Sugar Milling Council's website www.asmc.com.au

A number of sugar crystal products are produced for manufacturers and consumers: white sugar of varying grades, caster sugar, brown and dark brown, raw sugar, coffee crystals, demerara and icing sugar. All sugar crystal products complete the full refining process— raw, brown and dark brown sugar are made by re-introducing varying amounts of molasses (itself a natural product from the sugarcane milling process). The raw sugar we buy is different to the raw sugar produced in step 5 above.

Sugar liquids are used widely in industry. Liquid sugar is taken from the refining process prior to crystallisation, or can be made by dissolving white sugar in treated water. Liquids are used in beverage or food products.

Treacle is made from syrups that remain after white sugar is removed from the refining process. It has a distinctively strong flavour and dark colour. Golden Syrup is similar to treacle, however it passes through an additional decolourisation process.

By products from the mills are recycled—used as fertiliser and some extracted components can be used to make bioplastics, for example a polyethylene can be made from sugarcane.

4.3 The environmental impacts of sugar production

The Cane Growers association provide a detailed overview of environmental impacts and programs. The solutions to overcome negative impacts have been identified as:

- Minimum tillage: this has many beneficial effects for the soil health.
- Green cane harvesting and trash blanketing: process that retains the stubble from the previous crop with no burning—improves soil quality.
- Fertiliser and chemical usage—a self-regulatory training program is in place; with 60% uptake in Qld, resulting in a decrease in chemical usage.
- Irrigation: soil moisture monitoring and efficient irrigation methods are in place.
- Water quality and run-off: the nutrient content of run-off water is monitored and dams are commonly in place to capture run-off water so it can be reused.
- Soil health: acid sulphate soils have been a problem in NSW—rejuvenation and monitoring programs have been introduced
- Maintenance of riparian land and wildlife corridors: land clearance was always an expected part of increasing production. Riparian zones (vegetation close to water ways) now play a major role in filtering nutrient run-off, reducing erosion and preventing silt build up in the water way. These areas also provide wildlife corridors.

Investment in research and programs is assisting the industry to improve sustainability and productivity. Part of this work includes monitoring the health of the Great Barrier Reef. This is negatively affected by rich nutrient agricultural run-off and the development of ports. Further details on environmental plans and research are available at www.canegrowers.com.au.

4.4 Organic sugar

The Cane Growers Association in Australia have advised that there are many growers who follow close to organic principles in growing their cane, but no organic sugar is processed in Australia. Organic sugarcane is available for juicing from a number of suppliers. And the leaf matter from some of these growers is available as organic garden mulch.

The reason stated for there being no processed organic Australian sugar is due to the operation of the mills. It is not economically viable to separate batches of cane into organic and non-organic.

5.0 What impact could a sugar tax have on free sugar consumption and health?

5.1 Sugar-sweetened beverage tax

Sugary drinks are associated with dental decay and weight gain. Obesity is a risk factor for type 2 diabetes, heart disease and some cancers. The United Kingdom introduced a sugar tax on soft drinks in March 2016, which will be implemented in April 2018. Other countries that have a sugar tax in place are South Africa, Hungary, Mexico, France and Chile. Evaluation of the introduction of the tax into Mexico in 2014 has resulted in an average reduction in consumption of sugar-sweetened beverages by 7.6% over a two year period.

5.2 Estimated health benefits in Australia related to a sugar-sweetened beverage tax

Modelling research published in PLOS ONE on 13 April 2016 estimated that over 25 years, a 20% rise in the price of soft drinks and flavoured mineral waters would save 1,600 lives in Australia. It also suggests that 4,400 heart attacks and 1,100 strokes could be prevented. The research estimates that it would reduce the number of new type 2 diabetes cases by approximately 800 per year. The estimated overall savings to the health-care system being A\$609 million.

Additional facts from this research:

- The price rise would impact mostly on younger people, who consume soft drinks regularly.
- The decreases in consumption would result in small declines in the prevalence of obesity of about 0.7% in men and 0.3% in women.
- Even taking into account declines in consumption; the revenue collected from the tax would be more than A\$400m annually.
- If other beverages with added sugar not included in this study (such as energy drinks, fruit drinks, milk-based drinks and cordials) were also taxed, the revenue and health benefits would be even greater.

Figures from supermarket retail sales in 2015 showed that Australians bought around 1.1 billion litres of sugary drinks at a cost of A\$2.2 billion. This doesn't include what was bought from other retailers such as fast-food outlets, restaurants, cafes, cinemas, vending machines, hotels and convenience stores.

The majority of Australians support such a tax. A survey reported in August 2012 in the Health Promotion Journal of Australia showed that two-thirds (65%) of respondents were in favour of a tax on soft drinks if the money was used to reduce the cost of healthy food.

A sugar tax does not provide the total solution to growing rates of overweight and obesity and other chronic lifestyle diseases, but it could make a positive contribution. All sources of discretionary foods that are energy dense and nutrient poor, including those with added saturated fat, need to be considered, as well as other lifestyle factors such as exercise, sleep and stress.

In February 2017, the Australian government rejected the introduction of a tax on sugar-sweetened beverages. At the time of releasing this paper, no other strategies to reduce free sugar intake have been announced by the government.

5.3 Fiscal policies to promote healthier foods and beverages

Based on current research, The World Health Organisation (2016) suggests a number of fiscal policies to promote healthier foods and beverages:

- Subsidising fresh fruits and vegetables to decrease the price by 10 to 30%.
- Taxing foods and beverages that are high in free sugars, added saturated fat and salt, and trans fats.
- Applying excise taxes to specific food and beverage items. In Australia this type of tax is currently applied to alcohol, tobacco and fuel and petroleum products.
- Raising public support for new taxes by investing the new tax revenue into health services and programs to support healthier lifestyles.

6.0 Which food products in the Blue Mountains Food Co-operative contain free sugars?

1. Free sugars (see Table 1)
2. Drinks: juices, refrigerated beverages
3. Confectionary / chocolate
4. Protein and health bars
5. Sauce, relish, chutney
6. Dairy and alternative flavoured yoghurts

7.0 What are the criteria for choosing free sugars?

7.1 Nutritional value

As outlined in the table below, there is minimal nutritional difference between the free sugars. Rice malt syrup with its high GI value is not recommended. And the low GI value of coconut sugar requires further verification. The phytonutrients, vitamins and minerals present in some sugars are not at a level to impact on health, especially if we encourage people to have no more than 5 or 6 teaspoons a day. Honey offers antibacterial and antioxidant properties.

7.2 Environmental impact

Sugar, produced from sugar cane, has several major environmental impacts as outlined above. The sugar industry reports that negative impacts have been greatly reduced over the past two decades. Organic sugarcane is grown in Australia, but the ways in which the mills are operated prohibit the production of organic sugar.

Of all of the free sugars, honey requires the least processing. You have the choice of raw and heated honey. It is also produced in Australia, so has travelled less food miles than maple syrup and agave for example.

7.3 Flavour and purpose

On a practical level, free sugars are chosen for their flavour and for their purpose e.g. baking, preserving or sweetener in tea.

Table 1: Free Sugars

Sweetener Per 100g	Sugars	Kilojoules (kJ)	Glycemic Index (GI)	Comment
Coconut sugar	95	1567	35	It is made from the sap of freshly cut flower buds of the coconut palm. The GI value comes from one small study of volunteers in the Philippines. As coconut sugar contains a similar amount of sucrose as cane sugar, you would expect a GI of 65. The low GI could be due to the inulin (an indigestible starch) content. Further tests are required to confirm the GI. Some brands contain higher sodium levels, which is a detractor.
White sugar	100	1700	65	
Demerara sugar	99	1690	65	A few minerals but basically the same as white sugar
Raw sugar	99	1690	65	A few minerals but basically the same as white sugar
Brown dark sugar	96	1630	65	Contains a little potassium, calcium, magnesium and other minerals, but only a tiny contribution to you daily requirements. You may enjoy the richer flavour though.
Honey	82	1400	50-65	Naturally produced sweetener, which contain 75% sugars of which half is glucose and half fructose. The natural plant matter in honey offers antioxidant and antibacterial properties, but this would depend on the source. It also contains very small amounts of vitamin B and minerals. It has been used as a natural remedy for sore throats, as a laxative and for healing minor skin wounds, burns and ulcers.
Maple Syrup	88	1500	54	Made in Canada from the sap of the maple tree. It is mainly glucose (90-100%) with fructose (0-10%). It has traces of phytonutrients, vitamins and minerals. Take care to buy 100% pure maple syrup.
Agave	74	1300	15	From Mexico, Agave it is extracted from Agave plants. It is mostly fructose, making it 1.5 times sweeter than table sugar with a very low GI. The high fructose content can cause digestive disturbances for some people.
Rice malt syrup	80	1370	98	Tastes about half as sweet as honey. It is produced by cooking brown rice flour or starch with enzymes. The enzymes break the starches down into sugars. The final syrup is 45% maltose, 52% maltotriose and 3% glucose.
Fructose powder	100	1700	25 (15-19)	Sweeter than sugar (sucrose), so you may use less. Can cause bloating and diarrhoea.
Glucose powder	100	1700	100	Glucose is the standard used to compare with the GI of foods. It is the most readily absorbed sugar.

Cane sugar is sucrose, which contains equal amounts of glucose and fructose

Honey is denser than sugar, so if you substitute 1 teaspoon of sugar (4g) with honey (7g), then you will consume more kilojoules

Rice malt syrup contains glucose and maltose, which is made from two glucose units and maltotriose (three glucose units)

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