



# Are Carbohydrates Good or Bad for You?

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In this part of our review on carbohydrates, we focus on the relationship between carbohydrates and our health. For a basic introduction to carbohydrates, their forms and functions, please refer to our article on [‘The Functions of Carbohydrates in the Body’](#).

## 1. Introduction

In the article on [‘The Functions of Carbohydrates in the Body’](#) the different types of carbohydrates (including free and added sugars, starches and dietary fibres), how they are utilised in the body, and their glycaemic effects are discussed. In this article, carbohydrates are considered for their effects on health. Progress in scientific research has highlighted the diverse functions of carbohydrates in the body and their importance in the promotion of good health.

## 2. Carbohydrates in health and disease

Carbohydrates are an essential part of our diet and contribute, alongside other macro- and micronutrients we eat as part of various foods, to our overall health and wellbeing<sup>1,2</sup>. Carbohydrates are classified according to their molecular structure, but are usually divided into sugars, starches and dietary fibres, whereby high sugar intake (especially in liquid form) tends to be linked to unfavourable health outcomes and dietary fibres to positive health outcomes.

Carbohydrates:

- Provide us with energy to carry out all our [bodily functions](#)
- Affect our blood sugar and insulin levels as well as our fat metabolism
- Affect our dental health
- Support our digestion ensuring we have regular bowel movements and a healthy gut environment
- Affect the absorption of specific nutrients such as calcium during the digestion process

- Help us to feel satisfied after meals

Sugars are important to our daily functioning, particularly glucose as it is a direct energy source for our brain and muscles (see [Glucose and Mental Performance](#)). Yet the availability of many sugar-rich foods has led to an overall increased intake of sugars in the average diet of people in recent decades<sup>3</sup>. Particularly sugars in liquid form have been directly linked to overweight and obesity with children and adolescents being strongly affected by this tendency<sup>4</sup>.

Complex carbohydrates in the form of dietary fibres that are not broken down by our body's enzymes in the intestine deliver long-term health benefits. These dietary fibres include non-starch polysaccharides and resistant starches, as well as some of the oligosaccharides such as inulin. Some of these fibres pass through our intestine without any changes to them during bowel movements, whereas others are metabolised by the gut bacteria, which results in the formation of so-called short-chain fatty acids (SCFAs) that are beneficial for humans. Specifically, scientific evidence shows that a diet rich in fibre as found in fruit, vegetables and wholegrains (see 'Dietary Fibre') [5,6,7,8,9,10,11,12](#):

- Decreases the risk of cardiovascular and coronary heart disease as well as the risk of obesity
- Helps to lower blood pressure and LDL cholesterol
- Facilitates weight maintenance in healthy-weight adults
- Improves bowel movements and reduces transit time of food in the digestive tract
- Impacts our gut bacteria in a way which is considered beneficial for overall gut and brain health

Overall, high-fibre diets which are characterised by a high intake of vegetables, fruits, whole grains and legumes result in a decreased risk in cardio-vascular disease, coronary heart disease, colorectal cancer, obesity and type 2 diabetes, as well as having a positive impact on the gut microbiota (see 'Dietary Fibre').

## 2.1 Body weight

A recent systematic review concluded that high-carbohydrate diets do not increase the risk of obesity<sup>13</sup>, confirming expert panel conclusions from the FAO/WHO and the UK's Scientific Advisory Committee on Nutrition<sup>9,10</sup>. Looking at different carbohydrate groups such as either free (and added) sugars or dietary fibres in diets, the following scientific evidence is available<sup>5,7,8,9,14,15,16,17,18</sup>:

- There is insufficient evidence to draw conclusions on whether or not total (added) free sugar has implications on body weight, except for consumption of soft drinks in children and adolescents. Hence, national food based dietary guidelines in Europe recommend a decreased intake of soft drinks, but also of foods rich in free sugars, such as desserts and sweets<sup>5</sup>.
- It is currently unclear whether dietary fibres affect body weight directly; however, scientific evidence points to dietary fibre having a role in feeling satiated after meals, so preventing people to overeat and help maintain a healthy body weight. Such an effect may depend on fibre type and other factors to consider in the overall dietary habits of people<sup>2,19,20</sup>.

## 2.2 Diabetes

Diabetes mellitus is a metabolic disorder whereby the body cannot regulate blood sugar levels properly. The dysregulation of blood sugar occurs because the body is either unable to produce the hormone insulin (type 1 diabetes), which regulates the uptake of glucose from the bloodstream, or

the cells become unresponsive to the hormone (type 2 diabetes, affecting 85-95% of the diabetics). An intake of sugars beyond the WHO recommended 10% of free sugars (see '[The Functions of Carbohydrates in the Body](#)') in the diet may increase the risk of developing type 2 diabetes particularly in obese and physically inactive people<sup>8,17,21</sup>. Such diets are usually characterised by high intake of soft drinks and low intake of whole grains, vegetables and fruits<sup>22</sup>. For the management of type 2 diabetes it is unclear whether a decrease in overall carbohydrate intake improves the condition<sup>23</sup>. Diets naturally high in fibres, such as the Mediterranean diet, have been shown to help people that are suffering from type 2 diabetes<sup>24,25</sup>.

## 2.3 Cardiovascular health

Diets that are high in fibre-rich carbohydrates and include whole grains such as the Mediterranean diet reduce the risk of cardiovascular and coronary heart disease by 15-30%<sup>26,27,28,29,30</sup>. The impact of excess sugar intake on the development of cardiovascular diseases and indicators of disease such as blood pressure or cholesterol levels is still unclear<sup>8,9,10,27,28,29</sup>.

## 2.4 Cancer

For most types of cancer, there is insufficient scientific evidence to draw a clear link between diet and cancer risk. There is, however, conclusive evidence that the risk of developing colon cancer is reduced with a high-fibre diet<sup>8,9,32</sup>. Nonetheless, the World Cancer Research Foundations recommends that for the prevention of cancers in general, foods high in sugars, starches and fats as well as soft drinks should be limited as there is a strong link between overweight and obesity and the development of various cancers<sup>32</sup>.

## 2.5 Oral health

Dental caries is caused over time by high levels of free sugars (monosaccharides and disaccharides) in the diet<sup>33</sup>, but not starches or dietary fibre<sup>34</sup>. The free sugars are metabolised by bacteria naturally present in the mouth, and the formed acids degrade/demineralise the hard tissues of teeth (dentine and enamel). The main recommendation to prevent dental caries is to reduce free sugars in the diet<sup>9,32,33,34</sup>. Good dental hygiene practices (i.e. regular brushing of teeth), the use of fluoride, and reducing the number of eating/drinking moments on a day (with exception of un-sweetened beverages), can delay the onset of the disease, but not prevent it in the presence of a diet high in sugar<sup>34,35,36</sup>. Hence, the WHO recommends reducing free sugar intake to a maximum of 10% of total energy intake per day for the prevention of caries<sup>37</sup>. There is insufficient evidence to indicate that fibre is preventative in the development of dental caries<sup>34</sup>.

# 3. The role of carbohydrates during exercise

There is now substantial evidence that carbohydrates can improve the performance of athletes. The amount of carbohydrate intake needed to maintain endurance depends on the type and duration of activity with carbohydrate supplementation during exercise being effective mostly during 90 minutes and longer efforts<sup>38,39,40</sup>. Carbohydrate electrolyte solutions as part of energy gels or sports drinks have been recognised by the European Commission as maintaining performance and supporting water absorption during endurance exercise<sup>41</sup> (see also '[Optimum Nutrition for Sports Performance: Macronutrients and Micronutrients](#)').

## 4. Approved health claims for carbohydrates

For some carbohydrates there is supporting scientific evidence for a direct, positive health effect and consequently the European Commission has authorised that products containing these carbohydrates in a sufficient amount can carry a health claim. The following are examples of health claims related to carbohydrates that have undergone an assessment of their scientific validity by the European Food Safety Authority (EFSA) and are approved for use in the EU:

- Barley grain fibre contributes to an increase in faecal bulk and so reduces constipation;
- Beta-glucans (a type of dietary fibre) which are found in oats contribute to the maintenance of normal blood cholesterol levels;
- Consumption of pectins, which can be found in the skin of apples, with a meal contributes to the reduction of the blood glucose rise after that meal;
- Lactulose, which is a synthetic sugar that does not occur naturally in food, contributes to an acceleration of intestinal transit;
- Chewing gum sweetened with 100% xylitol is able to reduce dental plaque.

A full list of all carbohydrate-related health claims currently approved in the EU can be found in the EFSA database: [‘EFSA-approved health claims related to carbohydrates’<sup>42</sup>](#).

## 5. How many carbohydrates should you eat per day?

Carbohydrates are essential as part of a healthy and balanced diet and should make up between 45 to 60% of total energy intake<sup>7,9</sup>.

The most appropriate sources of carbohydrate are vegetables, fruits, wholegrains and legumes because of their dietary fibre content<sup>29,43</sup>. It is currently recommended to eat between 25 and 38 grams of dietary fibre per day for adults whereas for children the recommended amounts vary depending on age group<sup>5</sup>. In terms of free sugars, the WHO strongly recommends to keep the intake below 10% of total energy intake to reduce the risk of tooth decay, overweight, obesity and the development of cancers<sup>5,37</sup>. Further, the WHO considers a reduction of free sugars to 5% of total energy intake for additional benefits<sup>37</sup>.

So, what does this mean in terms of eating food?

- An optimum diet contains 45 to 60% of energy from carbohydrates per day for all those over two years of age
- Several EU countries recommend consuming at most 25 g free sugar per day (or 5% of the overall energy): that is about 6 teaspoons of table sugar; even ready-meals from the supermarket and other processed foods can already contain that much added sugar
- Adults should aim to consume at least 25 g dietary fibre per day. Here are a few examples of fibre-rich foods:
  - 3 tablespoons of kidney beans = 3 g of fibre
  - 100 g of bran flakes = 13 g of fibre
  - 75 g of whole-wheat spaghetti = 9 g of fibre
  - 3 tablespoons of cabbage = 2 g of fibre
  - 3 tablespoons of peas = 4 g of fibre
  - 1 apple = 4.4 g of fibre

- 1 cup lentils = 15.6 g of fibre
- 1 slice wholegrain bread = 2 g of fibre
- A wide range of carbohydrate-containing foods should be consumed so that the diet is sufficient in essential nutrients and dietary fibre: think of nuts, lentils, wholegrains and wholegrain products alongside fresh fruit and vegetables

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