



Association des Amidonneries
de Céréales de l'Union Européenne

DIETARY CARBOHYDRATES

Executive summary

For nutritional purposes, carbohydrates may be classified according to their physiological role rather than their chemical structure. In particular, the rate and site of digestion and fermentation can be used. This science-based approach should allow the discussion to move from the *level* of carbohydrate in the diet to the *type* of carbohydrate in the diet.

Position paper

Carbohydrates can be classified in many different ways. One common way is according to their structure. All carbohydrates are compounds of carbon, hydrogen and oxygen. They can be divided into three main groups according to the size of the molecule¹.

- Monosaccharides & disaccharides (sugars)
- Oligosaccharides (e.g. fructo-oligosaccharides, maltodextrin)
- Polysaccharides (e.g. starch, cellulose)

Carbohydrates are essential nutrients in the diet and have many important functions including providing energy and dietary fibre. WHO/FAO acknowledges that carbohydrates are critical to a balanced diet and recommends that they amount to at least 55% of the total energy value of our daily food intake. Obesity, non-insulin dependent diabetes, coronary heart disease, some cancers (notably colorectal) and other gastrointestinal tract conditions are among the diseases that can be beneficially influenced by dietary carbohydrates².

For nutritional purposes, carbohydrates can be classified according to their physiological properties in particular their digestion rate (e.g. fast, slow, resistant) should be used. For the 'resistant' (non-digestible) carbohydrates these can be further classified by their fermentation rate (i.e. fast, slow, partial or non). In addition, carbohydrates can be classified according to their potential to impact on blood glucose, which can be measured as "Glycemic Response" (GR) or Glycemic Index (GI). GR and GI are similar but are different measurements of the impact of dietary carbohydrates on blood glucose levels. WHO/FAO define GI as the incremental area under the blood glucose response curve of a 50 g available carbohydrate portion of a test food, expressed as a percent of the response to the same amount of carbohydrate from a standard food taken by the same subject. As the carbohydrate portion measured is available or digestible carbohydrate, dietary fibres such as resistant starch are excluded from the calculation of GI. GR however, measures the impact of all carbohydrates on blood glucose levels without correcting for available vs. non-digestible carbohydrates. Both GR and GI measure blood glucose and so are only relevant for comparing similar foods containing glucose or glucose polymers (i.e. glucose, maltose, maltodextrin and starch).

The term 'complex carbohydrate' is not recommended as it can mislead consumers. This term is used for the larger polysaccharides such as starch but from a nutritional/physiological perspective it is now known that a processed starch may digest more rapidly than 'simpler' carbohydrates. In the same way the terms 'soluble fibre' and 'insoluble fibre' are not recommended. Soluble fibres may or may not have a high viscosity, may or may not impact blood cholesterol and may or may not be fermentable – so to assume that all soluble fibres are alike is misleading. Similarly insoluble fibres may or may not be fermentable. As more information becomes available it will be possible to attribute specific benefits to specific carbohydrate types and thereby avoid generalisations.

¹ British Nutrition Foundation «(BNF) Nutrient Information – Carbohydrate <http://www.nutrition.org.uk/information/energyandnutrients/carbo.htm>

² WHO/FAO Expert Report, Carbohydrates in Human Nutrition, Nutrition Paper 66, April 1997.



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As a source of energy, 1 gram of carbohydrate provides 16kJ (3.75kCal). For the purposes of food labelling, a conversion factor of 17kJ (4kcal) is used, which is less than half the specific caloric content of fat. At EC level, the definition for Carbohydrate “means any carbohydrate which is metabolised in man and includes polyols”³. This definition therefore excludes non-digestible carbohydrates such as resistant starch – a source of dietary fibre⁴. Fibre is regarded as a separate nutrient and does not contribute to the carbohydrate content or energy value of a foodstuff.

Despite some modern diet plans promoting lower carbohydrate intake, many nutrition experts continue to stress the importance of carbohydrates in a balanced diet. Rather than focusing on the level of carbohydrate the focus should be on the different types of carbohydrate and their physiological effect, in particular their influence on Glycemic Response i.e. their digestion profile or the rate at which the carbohydrates are absorbed as glucose.

WHO/FAO Expert Report⁵ consultation refers to glycemic carbohydrates as available carbohydrates defined as “starch and soluble sugars” and non-glycemic (low-glycemic) as unavailable carbohydrates defined as “mainly hemicellulose and fibre (cellulose)”.

Low glycemic carbohydrates, such as dietary fibre found in resistant starch and intact whole grains, are metabolised more slowly and therefore associated with increased feelings of satiety and less between-meal hunger or cravings. Typically, foods containing low GR carbohydrates tend to have higher fibre contents and are therefore less energy dense – having a lower calorie content.

It should be noted that at EU level there is no harmonised legislation relating to health and nutrition claims. The EC has adopted detailed rules on labelling⁶ and nutrition labelling⁷ of foodstuffs and under the current legal framework, in relation to claims there is the basic provision that claims should not mislead the consumer. In addition, article 2 (1) (b) of Directive 2000/13/EC prohibits the attribution of preventing, treating or curing a human disease. However, the European Commission has now formally adopted a proposal to regulate nutrition and health claims made on foods.⁸ The Regulation currently being discussed at Member State and EC level will provide opportunity to have substantiated product health benefit & disease reduction claims approved to enable their use in consumer products.

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³ Council Directive 90/496/EEC, of 24th September 1990, on Nutrition Labelling of Foodstuffs, OJ N° L 276/40, 6.10.90

⁴ There is no definition for dietary fibre at EC level, discussions ongoing FAO/WHO Codex Alimentarius commission is proposing the following. Edible non-digestible plant material composed of carbohydrate polymers (Degree of polymerisation (DP) greater than or equal to 3). It may include fractions of lignin and/or other compounds when associated with polysaccharides in the plant cell walls and if these compounds are quantified by the gravimetric analytical method, which has been adopted for dietary fibre analysis (AOAC).

⁵ WHO/FAO Expert Report, Carbohydrates in Human Nutrition, Nutrition Paper 66, April 1997.

⁶ Directive 2000/13/EC, of 20/03/2000, relating to the labelling, presentation and advertising of foodstuffs, OJ N° L109/29, 6/5/2000.

⁷ Directive 90/496/EEC, of 24/9/90, on nutrition labelling of foodstuffs, OJ N° 276/40, 6/10/90.

⁸ COM (2003) 424 final, 2003/0165 (COD) Brussels 16/7/2003.