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Nestlé Professional Nutrition Magazine

CARBOHYDRATES

CONTENTS

Nestlé PROFESSIONAL

GOOD TO REMEMBER

- **Monosaccharides:**
  Glucose, fructose, galactose
- **Disaccharides:**
  Saccharose = glucose + fructose
  Lactose = glucose + galactose
  Maltose = 2 x glucose
- **Polysaccharides:**
  Starch, glycogen, dietary fibre

Carbohydrate – the most important nutrient for the body in terms of volume – is the generic term for a wide range of compounds made up primarily of the following three components: glucose, fructose and galactose. The characteristics of carbohydrates and their use in the kitchen and the food industry as a whole vary according to their size and composition. In digestible form, they primarily serve to provide the body with energy, and as indigestible substances (dietary fibre), they aid digestion.

GOOD TO KNOW

Occurrence of carbohydrates

Carbohydrate	Found in
Glucose	Fruits, honey, traces in most plants
Fructose	Fruits, honey, traces in most plants
Galactose	Component of lactose
Saccharose	Sugar cane/beet, fruits, maple syrup
Lactose	Milk, milk products
Maltose	Legumes
Starch	Grains, potatoes, vegetables, fruits
Glycogen	Liver, muscles
Cellulose	Grains, vegetables, fruits
Pectin	Fruits, vegetables

TRUE OR FALSE?

"Carbohydrates make you fat" – as it stands, this statement is false. The body only converts carbohydrate/glucose into saturated fatty acids and stores it in fat tissue if you consume about as much as 400–500 g per day.

Structure/types

Carbohydrates (CHO) consist of chains of simple sugars (monosaccharides) that are of varying lengths and are sometimes branched. They are divided into various groups, depending on the number of these chains:

A Monosaccharides (simple sugars)

- **Glucose:** main component of polysaccharides and key substance in human energy metabolism
- **Glucose syrup:** concentrated solution derived via enzymes from starch, not as sweet as saccharose (sucrose); used to sweeten food/drinks and in the production of sweets
- **Fructose:** soluble in water, highest level of sweetness, fermentable with yeast, insulin-independent conversion in human body

B Disaccharides

- **Saccharose:** glucose + fructose, caramelizes in dry heat (caramel, caramel colouring)
- **Invert sugar:** created by mixing a saccharose solution with acid and heating it, less sweet but fruitier than saccharose, used as invert sugar syrup in the food industry and as sugar syrup for cocktails
- **Lactose (milk sugar):** glucose and galactose, not readily soluble in water and not very sweet
- **Maltose (malt sugar):** 2 x glucose, very little sweetness, does not occur in free form, but only as a product of starch degradation, e.g. in germinating grain (beer production)

C Polysaccharides

- Consist of at least 10 components and are divided into digestible and indigestible forms. The most common examples are:
- **Starch:** Main storage compound for plants; consists of amylose, which is soluble in hot water, and amylopectin, which swells and absorbs water at 60 °C (formation of a starch paste).
- **Modified Starch:** Starches processed chemically with the aim of securing various characteristics, such as greater resistance to heat/cold, improved swelling qualities and hence flow properties. Used as a thickener, carrier and stabilizer. Must be labelled as a food additive if it has been chemically modified.
- **Glycogen:** Most important storage polysaccharide in the animal/human body.
- **Maltodextrin:** Enzymatic product of starch degradation; water-soluble, easily digestible and very little sweetness. Used in dietetics (fortification of food) and food production, e.g. as a filler, thickener, fat substitute and carrier for sensitive and volatile flavourings.

Dietary fibre

The term "dietary fibre" refers to a group of plant-based substances that are indigestible by humans but are partially or completely fermented in the intestine. Depending on their solubility – which determines their various physiological effects – a distinction is made between:

A Insoluble dietary fibre:
e.g. cellulose and lignin; occur primarily in whole wheat products; vital for ensuring normal intestinal activity. Leads to an increase in stool volume and intestinal movement (intestinal peristaltic reflex), counteracts constipation, diverticulosis (bulging pouch in intestinal wall) and haemorrhoids, and possibly prevents colorectal cancer.

B Soluble dietary fibre:
e.g. pectin and guar gum; found primarily in vegetables, including potatoes, fruits and seeds. Consumed in sufficient quantities, it can reduce cholesterol levels and have a positive effect on blood sugar levels.

Functions

Digestible carbohydrates serve the body primarily as a source of energy

– directly for conversion to body energy,
– over the short term as storage material (glycogen) in liver and muscles or
– in the long term for conversion to fat if energy is eaten in excess.

GOOD TO REMEMBER

Recommended Consumption

- **at least 50% of daily energy**
  ♀ 230g CHO per day
  ♂ 300g CHO per day
  (Basis: average level of activity, Source: DACH)
  at least 30g of dietary fibre

Recommendation for the US/Canada:

- **45–65% of energy**
- **Dietary fibre:**
  19–30 years: 25g (♀) or 38g (♂)
  31–70 years: 21g (♀) or 30g (♂)

GOOD TO KNOW

Regulation of blood sugar level:

The two vital regulators of blood sugar levels are the body's own hormones insulin and glucagon. If the level of glucose in the blood rises, insulin is released from the pancreas, with glucose entering the cells. In addition, insulin activates the conversion of glucose into energy and the formation of glycogen.
If the blood glucose level falls below a certain level, the pancreas releases glucagon (an insulin antagonist). This leads to the conversion of liver glycogen and its release into the bloodstream, causing the blood sugar level to rise again.

GOOD TO REMEMBER

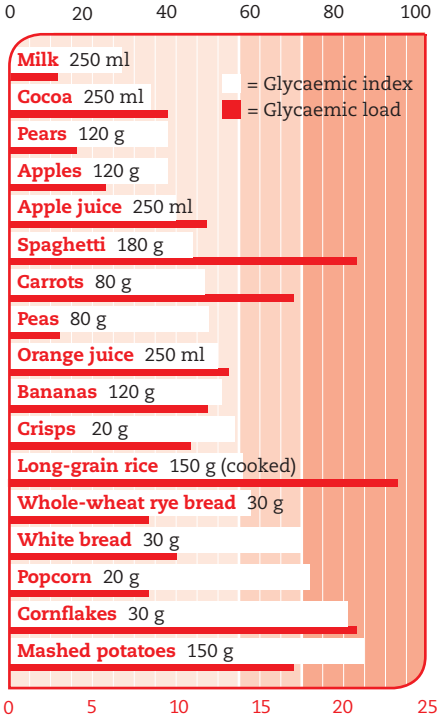
Scientific evaluation

There are currently no long-term scientific studies that allow for a clear evaluation of nutrition for healthy people on the basis of the GI of food. However, a heavy consumption of animal protein (higher risk of gout, kidney disorders etc.) is seen as problematic.

GOOD TO KNOW

Carbohydrate modified diets

- **Basic principle:** Reduction of carbohydrate-rich foods in the diet in favour of those containing high levels of protein and fat.
- **GI:** Effect of carbohydrates in foods on blood sugar levels; depends on the composition of the food, level of maturity, preparation and processing and personal factors.
- **GL:** Uses standard portion sizes.
- **Atkins:** Most radical form; four phases; in phase 4 the intake of CHO increases to a level determined by the individual with a maximum of 100 g.



Carbohydrate modified diets

Basic principle

Eating a low-carb diet means consuming a small proportion of mono- and disaccharides in favour of fat and protein. Depending on the kind of diet, this means between 20 g and 100 g of digestible carbohydrates per day. There is, however, currently no binding definition of when a diet becomes "low carb". This regime of eating was promoted by Dr. Robert Atkins. In addition to a reduction in carbohydrates, the newer low-carb forms also encourage the evaluation of food on the basis of its glycemic index and glycemic load.

GI 70 and above: High GI, e.g. white flour products, white potatoes, white rice.

GI 56 to 69: Medium GI, e.g. whole-wheat products, vegetables high in starch.

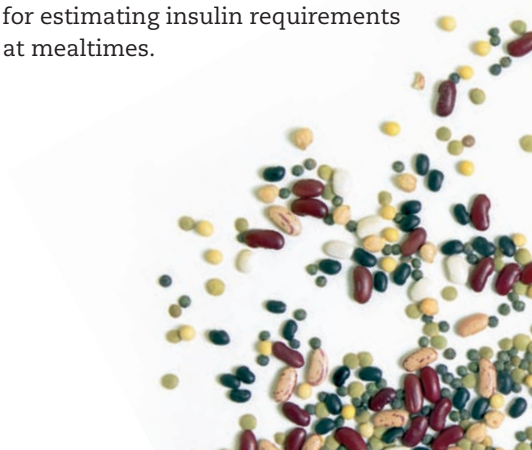
GI up to 55: Low GI, e.g. lots of fruits, vegetables low in starch, nuts, legumes.

Glycemic index (GI)

The GI describes the effect of a food containing carbohydrates on the blood sugar level and hence the release of insulin. The higher the GI, the higher the increase in blood sugar level and the greater the amount of insulin released by the pancreas. The basis of the GI is taken as the effect of 50 g of glucose on the blood sugar level, with a comparison being made between all foods and the reaction they arouse in the blood sugar level following consumption of 50 g of carbohydrates from each food item. For example, there are 50 g of carbohydrates in ca. 1 kg of carrots or 650 g of watermelon.

Glycemic load (GL)

The GL takes into account not only the type of carbohydrate consumed, but also the amount of carbohydrates contained in a normal portion. Example: watermelon has a GI of 72. One portion (125 g), however, provides just 6 g of digestible carbohydrates. The GL is approximately 4. White bread has a GI of 70. An average portion (30 g) contains 14 g of digestible carbohydrates, which means that the GL is 10. At the moment the GL is a more relevant parameter for estimating insulin requirements at mealtimes.



Lactose intolerance

What is it?

Lactose intolerance is caused by the insufficient activity or deficiency of the enzyme lactase. As a result, the body is unable to break down lactose in the small intestine, and the lactose moves on to lower parts of the intestinal tract, where bacteria break it down into various acids, carbon dioxide and hydrogen (causing flatulence).

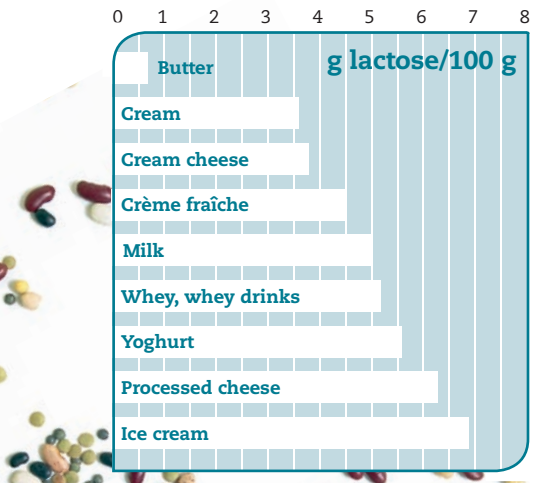
Symptoms

The symptoms of lactose intolerance are stomach cramps, flatulence and diarrhoea. The intensity of the symptoms and the amount of lactose a person can tolerate before developing the symptoms vary from person to person. Depending on how much lactose a patient can tolerate per day, the severity of the disorder is categorized as follows:

- **mild:** 8–10 g per day without symptoms (e.g. 10 g lactose in 200 ml milk)
- **moderate:** 1–7 g per day without symptoms
- **severe:** no lactose

Treatment

Non-consumption (lactose-free diet) or low consumption (low-lactose diet) of milk and milk products and foods that contain them. Most patients remain free of symptoms on a low-lactose diet (8–10 g a day).



Guidelines for the kitchen

– **Milk:** When patients/guests are lactose intolerant use low-lactose or lactose-free milk, or replace with other products such as soy milk – if possible calcium fortified soy milk – and rice milk.

– **Milk/sour milk products:** Fermented milk products such as probiotic yoghurt, kefir and cultured milk are often well-tolerated due to their lactase content.

– **Cheese:** Hard, semi-hard and soft cheeses contain little or no lactose. Use as a valuable source of calcium.

– **Finished products:** Bread and other baked goods, meat and fish products, instant products, readymade meals, sweets, preserved vegetables, thickeners, binders and flavourings contain varying levels of lactose. Study the list of ingredients or contact the manufacturer before use.

– **Sources of calcium:** People on low-lactose or lactose-free diets are at risk of suffering from a calcium deficiency and even developing osteoporosis. In order to prevent this, they should eat more

- buttermilk products,
- calcium-rich vegetables such as broccoli, cabbage, spinach, fennel and leek,
- calcium-rich mineral water (at least 150 mg Ca per litre) and/or
- fruit juices enriched with calcium (not available everywhere).

GOOD TO KNOW

Lactose intolerance

– Lactose intolerance due to lactase deficiency
– Different levels of severity
– Treatment: low-lactose or lactose-free diet
– Important: include other sources of calcium in the diet

GOOD TO REMEMBER

Celiac disease

Intestinal disorder associated with the impaired absorption of nutrients

- **Reason:** Gluten (wheat protein) sensitivity
- **Treatment:** Treatment is based on a lifelong gluten-free diet, which means no products derived from wheat, rye, barley and oats. Even the smallest amounts of gluten can lead to a deterioration in the patient's state of health.

Celiac disease

What is it?

Celiac disease is a disorder of the small intestine, which results in the impaired absorption of nutrients. It is caused by toxic-allergic damage to the lining of the small intestine by a special wheat protein (gluten). This results in inflammation and the associated villus atrophy (important for nutrient absorption).

Symptoms

Frequent large, greasy and foul-smelling stools, swollen stomach and/or flatulence, loss of weight and appetite, fatigue and paleness. The development and extent of the symptoms of the disorder vary greatly. If it remains undiagnosed, mineral and other deficiencies can occur, and in severe cases a secondary lactose intolerance may develop.

Treatment

Treatment is based on a lifelong gluten-free diet, which means no products derived from wheat, rye, barley and oats. Even the smallest amounts of gluten can lead to a deterioration in the sufferer's state of health.

Guidelines for the kitchen

Gluten-free alternatives:

> Corn, rice, millet and buckwheat and their derivatives, provided they do not contain any gluten-based additives

> Potato and corn starch

> Fresh or freshly processed fruits and vegetables

> Potatoes

> Meat, poultry, fish: unprocessed, they are gluten-free. Caution is advised with processed products

> Milk and milk products: all natural products are gluten-free. In the case of products with additives or mixed products, e.g. fruit or muesli products, yoghurt products, low-fat products, condensed milk and cream for coffee (ask manufacturer)

> Cooking oils

Avoid:

> All food derived from (e.g. bread, pasta, beer, malt coffee) or containing (e.g. muesli mixtures, oats) the types of grain mentioned. Lists of foods that contain/do not contain gluten are provided by gluten-allergy organisations

Be careful:

> Products with flavourings, colourings, emulsifiers, stabilisers, binders and other additives can contain gluten (note list of ingredients or ask manufacturer)

> Products such as spreads, ketchup, soy sauce, ice cream, liquorice, chocolate bars and drinks containing cocoa may contain gluten. Pay attention to ingredients or ask the manufacturer for accurate information

Dietary fibre tips

A few tips to help you encourage your guests to accept more dietary fibre and therefore a healthier diet:

1 Increase your use of high-fibre food slowly but surely. Ensure sufficient water consumption, as dietary fibres need water in order to take effect.

2 Use more whole-wheat products in the form of whole-wheat bread and pasta, natural whole grain rice and cereals. Cereals are also suitable for binding mixtures.

3 If your guests are sceptical about whole-wheat products, introduce them slowly, increasing amounts as time goes on. Important: adjust the meal in line with the "new" taste.

4 Legumes also contain a great deal of dietary fibre. Use them not only in casseroles but also in salads.

5 Use more high-fibre vegetables such as broccoli, cauliflower, sprouts and fruits such as apples, pears and red currants/black currants. Dried fruits contain particularly large amounts of fibre and are a good snack.

GOOD TO KNOW

30 g of dietary fibre per day – a sample selection!

- **3 slices of whole-wheat bread (150 g)** approx. 13 g
- **3 potatoes (250 g)** approx. 6 g
- **1 portion of cauliflower (200 g)** approx. 6 g
- **1 apple (100 g)** approx. 2 g
- **1 large carrot (100 g)** approx. 3 g

QUIZ

1. **Which monosaccharide is the main component of polysaccharides?**
   - P Glucose
   - M Fructose
   - V Galactose
2. **What does invert sugar consist of?**
   - R A saccharose solution
   - S A lactose solution
   - Z A maltose solution
3. **What effect does insoluble dietary fibre have?**
   - W Reduces cholesterol
   - D Increases the appetite
   - O Increases the intestinal peristaltic reflex
4. **What does a carbohydrate modified diet mean?**
   - F Restrict carbohydrates
   - K Restrict fats
   - N Restrict movement
5. **What does the glycemic index tell us?**
   - A The amount of carbohydrates in a meal
   - E The effect of foods containing carbohydrates on blood sugar levels
   - O The sequence in which food items are consumed
6. **What is missing from the body in the case of lactose intolerance?**
   - L Lactose
   - S Lactase
7. **Are people who are lactose-intolerant allowed to eat cheese?**
   - S Yes
   - B No
8. **Which type of grain is NOT allowed with celiac disease?**
   - E Corn
   - U Millet
   - I Wheat
9. **Can ketchup contain gluten?**
   - O Yes
   - A No
10. **Do carbohydrates make you fat?**
    - M Yes
    - N No
    - C Don't know
11. **What is high in fibre?**
    - U Beaf
    - E Salad
    - A Carrots
12. **Is it difficult to create a diet with 30 g fibre per day?**
    - Z Yes
    - L No
    - P Don't know

1	2	3	4	5	6	7	8	9	10	11	12

Answer: PROFESSIONAL

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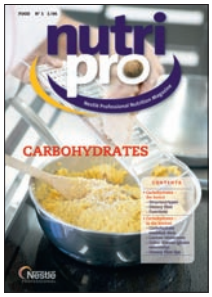

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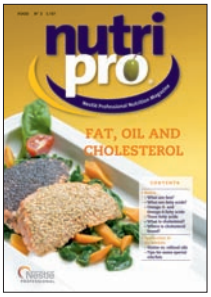

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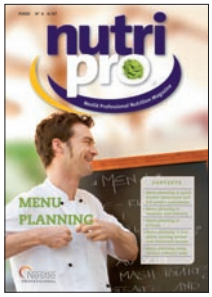

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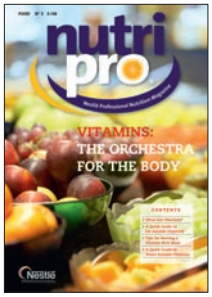
Menu Planning



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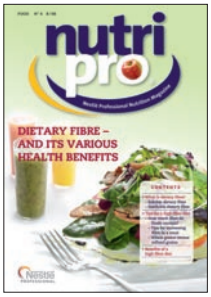
Vitamins:
The Orchestra
For The Body



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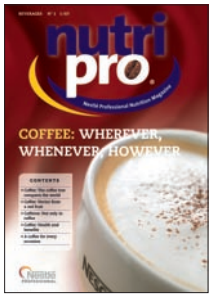

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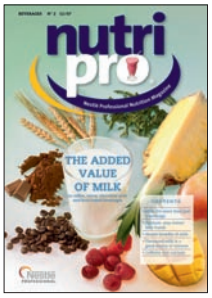
Coffee: Wherever,
Whenever, However



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