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# **CARBOHYDRATES in human nutrition**

# Carbohydrates / Saccharides

- monosaccharides (glucose, fructose)
- disaccharides (saccharose, lactose)
- oligoaccharides
- polysaccharides (starch, glycogen, pectins)

# Carbohydrates – the optimal source of energy

- There are other energy sources (fatty acids, aminoacids, etc.) but not for all tissues:
  - **red blood cells** can use blood glucose only,
  - **brain** can use mainly blood glucose and galactose.

An average daily glucose demand in an adult:

- **brain** – 125 g of glucose
- **red blood cells** – 55 g of glucose

# All carbohydrates break down into glucose very easily.

## Non-carbohydrate energy sources:

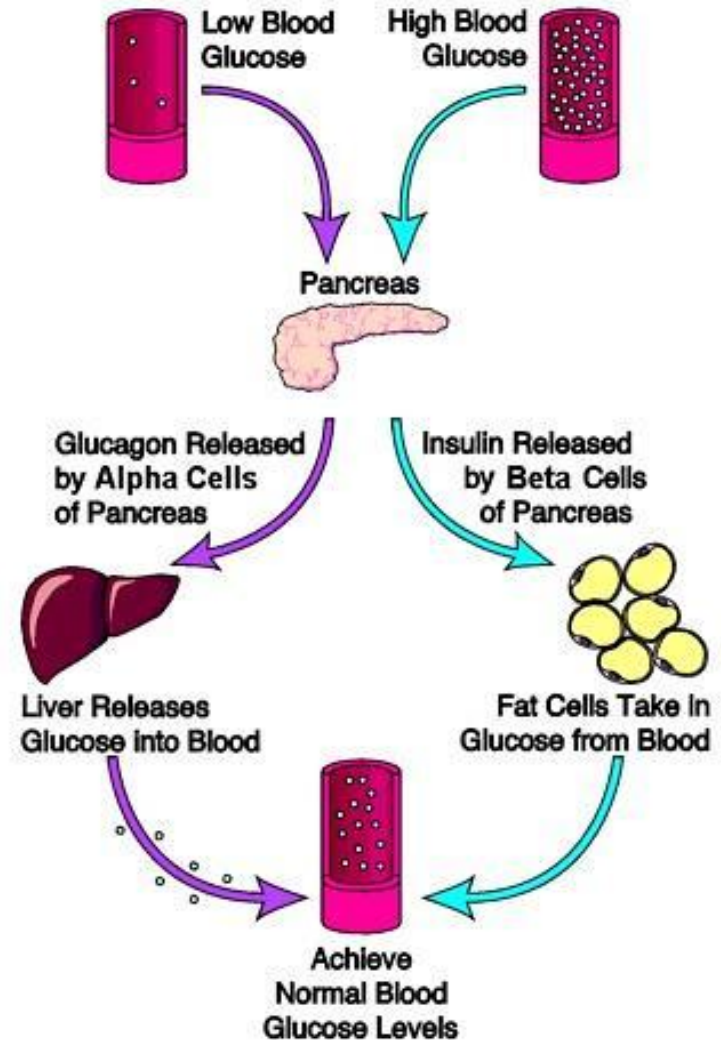
- Lipids (fats): only their glycerol part (approx. 10 % of total triacylglycerol energy).
- Proteins: only some aminoacids (approx. 60 % of total protein energy).
- Lactic acid: it is reduced into glucose during vigorous bodily activity.

# Carbohydrates / polysaccharides and their nutritional value

- **Digestible** – carbohydrates (sugar, starch) = energy + synthesis of necessary molecules.
- **Indigestible** – polysaccharides (cellulose, pectins) = dietary plant fiber.

# Cleavage of carbohydrates

- **Fructose and galactose** are reduced to glucose which is absorbed into blood.
- **Constant blood glucose level** is maintained hormonally – **insulin** and **glucagon** – see the picture.



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# Blood glucose level oscillations

- Mean level in healthy people: 80-100 mg of glucose/100 ml of serum = 4,4-5,6 mmol/l.
- Over 180 mg/100 ml of serum: glucose is excreted via kidneys (**glycosuria**) and skin.
- Below 60 mg/100 ml of serum – **hypoglycemia**.

# Glucose demands

- 2,9 g / 24 hours / 1 kg of body weight.
- The brain needs one half of this amount .
- Red blood cells, renal medulla and bone marrow require another 25 %.



# Normal blood glucose level

- **Basic condition: a balanced energy intake**

## Reserves:

- **Liver glycogen (energy storage)**
- Liver glycogen reserve is sufficient for 8-10 hours.
- **Muscle glycogen** can be used by muscle cells only!

# Blood glucose level increase

## After meals

- **Insulin** concentration in blood increases within a short while.
- **The increase depends on several factors** (genetics, age, obesity, diet, some diseases).
- **Surplus of glucose** is synthesised into glycogen and stored in the liver, muscles and fat cells.

# Insulin and beta-cells of the pancreas

- **Beta-cells produce insulin.** Frequent and marked oscillations of blood glucose levels damage them.
- **Chromium** is necessary for optimal insuline functioning (it is a part of the glucose tolerance factor).
- Its deficiency provokes the loss of insulin effectiveness and a metabolic disorder develops (one of diabetes types).

# Diabetes mellitus –

the organism is not able to maintain physiological values of blood glucose level

Possible causes:

1. Insulin deficiency and glucagon surplus.

2. Insulin resistance: defective responsiveness of some tissues (a reduced number of cell receptors, or low insulin effectiveness, chromium deficiency, etc.) = **diabetes mellitus type II** (adult-onset diabetes, or non-insulin dependent diabetes).

3. Decreased insulin production, or its complete deficiency – beta-cells destruction = **diabetes mellitus type I** (juvenile diabetes, or insulin dependent diabetes).

# Insulin blood level following a meal

## Three possibilities

1. Insulin blood level increases very fast after meal; as soon as the glucose blood level drops, insulin falls to a very low level again = healthy people.

**2. Insulin blood level increases very little** and then goes on increasing for about 80-90 minutes, while blood glucose level increases very fast and remains on high values for a long time = **potential diabetes type II.**

**3. Blood levels of glucose and insulin increase adequately but while glucose level drops after some time, **blood insuline level remains high.****

Blood glucose level goes on decreasing (60-50 mg/100 ml of serum) =  
**transient hypoglycemia.**

# Foods limiting oscillations of glucose and insulin levels

- **Proteins and fat** do not influence glucose blood level unless consumed in very large quantities.
- **Food of animal origin** – with the exception of **dairy products** – very little influence on glucose blood levels.
- **Carbohydrates**: high influence on blood glucose level; whole flour bread and pastry, fruit and vegetables are preferable to white bread and sweetened food and drinks.

# Glycemic index (GI)

- GI = how much a gram of available carbohydrate in food raises a person's blood glucose level following consumption of the food, relative to consumption of pure glucose.
- **Low GI foods** increase glucose blood level less and the level falls to normal values faster.
- **Higher GI food:** white flour pastry, sweetened breakfast cereals, root vegetables.
- **Lower GI food:** whole flour pastry, legumes, other vegetables, fruit and dairy products.



# Factors influencing glycemia

- + **Dietary fiber** (fruit pectins and legume galactomannan) reduces oscillations of blood glucose levels because it slows down digestion and intestinal absorption of carbohydrates.
- + **Carbohydrate digestion inhibitors** (in legumes, cereals, etc.) slow down cleavage of starch.
- + **Interaction between carbohydrates, proteins and lipids** slows down starch digestion.
- +/- **Form of food** – cereals ground into flour increase blood glucose level more than whole grains.

- +/- **Food processing** – cooked food releases more starch and increases glucose blood levels more than raw food; industrially processed food has a higher GI than home made food (processed at a higher temperature and pressure).
- + **Type of starch** – starches with higher amylose level (eg. of legumes) are less digestible, and have a lower GI.
  - **Salt** – increases the glycemic curve; **chlorine** activates amylase, **sodium** stimulates glucose absorption.
- +/- **Fat** – slows down digestion, and lowers GI. But a high fat diet has other health risks!

# Starch + dietary fiber

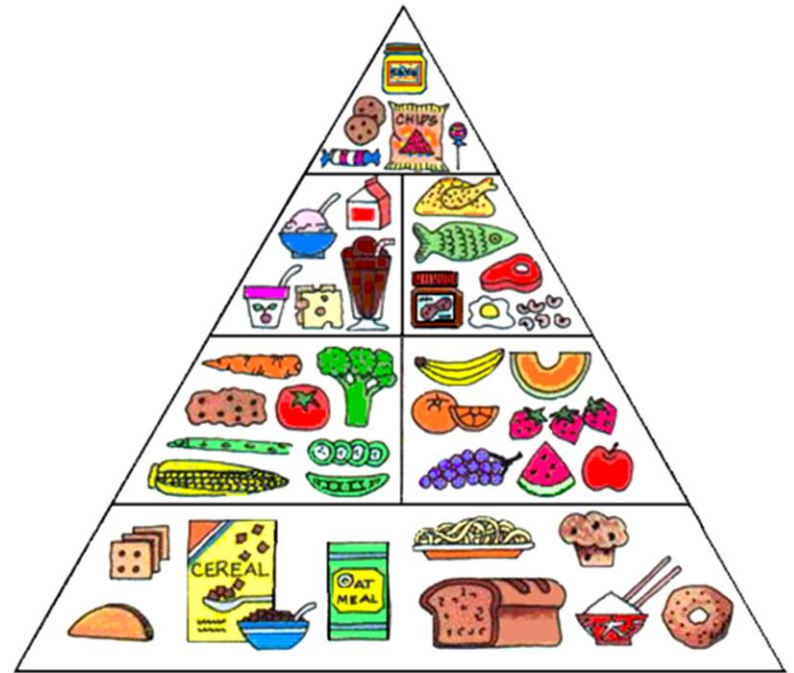
- They constitute a substantial part of our nourishment:

cereals, legumes, potatoes, vegetables, fruit.

- Dietary fiber prolongs the digestive process

up to 3-4 hours, without significant oscillations of blood glucose level. Low need for insulin!

**Your pancreas will thank you.**



# Isolated mono- and disaccharides

- It is recommended to consume a very small quantity of sugar
- **Saccharose** – a disaccharide, obtained from sugar beet and sugar cane is not a natural constituent of human nutrition and its excessive intake is harmful.
- Maximum daily intake: 50 g of sugar.
- **Optimal yearly intake: sugar 10 kg + honey 6 kg.**
- **Be careful of hidden sugar** (white bread and pastry, syrup, sweet soft drinks, confectionery).

# Negative effect of saccharose

- It impairs the nervous system, heart and kidneys.
- It contributes to obesity.
- About 50 % of ingested sugar is changed into energy („burnt“), 5 % is changed into glycogen and 30-40 % is metabolised into fat. The precise numbers depend on physical activity, temperature, etc.
- **Saccharose is not a suitable source of energy!**

It is a pure nutrient; it deprives the human body of the minerals and vitamins indispensable for metabolism (above all B-vitamins, calcium and magnesium).

# Lactose and galactose

- **Lactose** – milk sugar, a constituent of breast milk. In the small intestine of babies and small children it is reduced into glucose and galactose by the enzyme **lactase**.
- **Galactose** has several important functions. It is necessary for brain development in small children. It stimulates calcium absorption in their intestines. It is changed into glucose in the liver of babies very fast. It inhibits reproduction of pathogene bacteria.
- **The ability of lactose cleavage in children decreases with maturity.**

- **Some adults** (18-20 % of European population) cannot metabolise lactose at all because their organisms do not produce lactase any longer.

**They can drink a maximum of 100-150ml milk per day (5g of lactose).**

- More than 70 % of the European population maintains lactase production into adulthood and can drink a limited quantity of milk without any negative health consequences.
- **Deficiency in lactase production in adults is probably genetically conditioned.**

# Carbohydrates vs. blood lipids

- Carbohydrates, depending on their type and quantity, **increase cholesterol levels** in blood. The same applies for **triacylglycerol levels** in blood and liver.
- **Carbohydrates containing fructose** (saccharose, invert sugar, honey, fructose itself) stimulate lipid synthesis and increase lipid blood levels.
- Increased intake of carbohydrates and saturated fats stimulates this negative process further.



- **Not only fructose has a negative influence on human health.**
- **Maltose** (a disaccharide, 2 molecules of glucose) stimulates lipid synthesis even more than saccharose.
- **Stress** – another factor enhancing lipid synthesis. That is why stressed people put on weight easily. Besides, stressed people have the tendency to overeat and to consume sweet things (comfort eating).

# **Carbohydrates and their influence on body weight increase**

By order of priority:

**1. Maltose**

**2. Saccharose**

**3. Inverted sugar, honey, fructose**

**4. Starch**

**5. Glucose**

- Carbohydrates should make about 60-75 % of our daily diet – **mainly polysaccharides (starch) and dietary fiber:**

cereals, potatoes, legumes, vegetables, fruit.

- **Isolated carbohydrates, above all saccharose („sugar“), should be consumed in very limited quantities.**

# Carbohydrates and detoxification



**„Approximately half of all clients coming to my practice have metabolic toxins in their bodies, causing their health problems.“**

- Metabolic toxins are very often the main toxin, or form a part of the overall toxic load.

- Whilst majority of books about metabolic disorders and food intolerances recommend an exclusion diet, **I recommend** excluding at one time e.g. milk or yeast, at another time pork or fish and so on, so apart from a healthy diet also a selective diet eliminating a particular food group at a time.
- **People are rarely capable of staying on a diet in the long term!**

I know a person who for 10 years has not eaten any foods containing gluten, but he continued to experience problems related to gluten intolerance.



**A diet will not guarantee the elimination of a harmful food substance originating from the time prior to comencing the diet.**



**Apart from diet, Joalis method offers an exclusive process of detoxification to eliminate metabolic toxins, and above all, also a method of resolving metabolic disorders.**



**Metabolic disorders involve all food groups.**



# **„Metabolic disorders“**

- It is a wide term and might not relate to illness.
- The correlation with the state of health may be indirect.

# The negative influences of food on human health may be categorised in the following order:

A. A person is not showing symptoms of a metabolic disorder, but the food consumed in larger quantities is harming the organism. This would mostly include food differing from its natural form.

*E.g. Smoked meats, tinned and processed foods.*

**B. A person is showing symptoms of a metabolic disorder, badly metabolised food is already causing serious health problems.**

*E.g. casein, lactose and gluten intolerances, disorders of carbohydrate metabolism.*

**C. Food allergies**

- In detoxification medicine, we are mostly concerned about metabolic disorders.
- **In cases of carbohydrate metabolism disorders, various malfunctions can be observed: blood glucose levels oscillations, accumulation of sugar residues in the nervous tissue, excretion of saccharides via mucosa and skin.**
- **These can have serious health consequences.**

# Case studies

- Woman (40 years old) suffers migrains accompanied by temporary blindness.
- Boy (10) suffers spasmic stomach pains followed by high fever lasting 2-3 days without any apparent infection.
- Boy (8) suffers anxiety attacks, night terrors, and random stomachaches.

- **A woman says:** „I suffer vaginal mycosis which keeps reoccurring stubbornly despite regular visits to my gyneacologist. I have an itchy anus, constipation alternating with diarrhoea and a white-coated tongue. I am constantly tired. Doctors maintain that I am absolutely fine.“
- **Woman (67)** shouts from her sleep at night and suffers short-term periods of high blood pressure. Epileptic father, used to be excessively angry. Diabetic grandmother.
- **Student (24)** – sudden deterioration of mild eczema, now the whole body covered with itchy skin which he scratches at night.



Ill health brought on by saccharides is caused by many factors:

- **Long-term overeating of saccharides and starches**

- **Irregular diet**

- **Beta-cell damage**

(consequently even a small amount of sacharides and starches ingested causes occillations of blood sugar levels)

**In approximately 20% cases, human bodies can't harmonise an adequate production of insulin with blood sugar levels.**

- This results in states of irritation (activity) and slumps. Sometimes there is too much sugar in blood, sometimes too little.
- The situation above causes a repeat damage to the body or leads to a significant aggravation of symptoms brought on by other causes

- A woman suffers with strong allergies. Her specialist doctor says she is allergic to almost everything, but he is unable to help her.
- She has an itchy skin, breathing difficulties, is unable to get enough sleep. She suffers allergies and a carbohydrate metabolism disorder.

**Allergy is a certain condition of brain, which is stimulated by saccharides.**

## Difficulties arising due to improperly regulated metabolism of carbohydrates have many causes:

- A. Accumulation of saccharide residues in the nervous system:** CNS, peripheral nerves, autonome nerves. Arising electric discharges irritate the nervous tissue. Manifestations are various: epilepsy, migraine, vegetative dystonia and vegetative collapses.
- B. Saccharides excretion via skin and mucosa:** Fungal infections, massive yeast reproduction on these tissues.

- C. Blood glucose oscillation** causes tiredness, states of irritation and energy slumps, sleepiness.
- D. Chronic latent acidosis** – acid-base balance in the blood is maintained but acid values appear in urine. (Optimal pH values of urine 7,1 - 7,5.)
- E. Vitamin B deficiency**
- F. Demineralization**
- Calcium (Ca)
  - Chromium (Cr)
  - Lithium (Li)
  - Selenium (Se)

Even persons with proper carbohydrate metabolism can be harmfully affected by the consumption of concentrated sugars

Findings of all the following ill-effects are supported by research.

**A. Negative influence on memory, learning, problem solving**: the study was examining the effects of high fructose syrup, which is used for flavouring fizzy drinks, biscuits, processed sauces etc.

**B. Obesity** – carbohydrates are metabolised into fat.

- D. Physiological processes connected with stress
- E. Dental caries
- F. Diabetes mellitus
- G. Peptic ulcers
- H. Suspected effect on the emergence of cancer cells, especially breast cancer
- I. Behavioral disorders, depression, panic and anxiety attacks
- J. Fungal infections
- K. Electrical discharges in the nervous tissue

# Carbohydrate metabolism and detoxification

- CORTEX
- VELIENDREN
- PANDREN
- METABEX
- MEBOL
- MEZEDREN





# How do the individual preparates work?

- **CORTEX**: detoxification of the brainstem (regulation of metabolism of all nutrients, regulation of the hormonal system and autonome nervous systém).
- **VELIENDREN**: regulates energy of the spleen, a parental organ of the pancreas.

- **PANDREN**: detoxification of the pancreas (alpha- and beta-cells producing glucagon and insulin).
- **METABEX**: detoxification of residual saccharides accumulated in different tissues.
- **MEBOL**: activation of tissue enzymes important for metabolic processes.
- **MEZEDREN**: in preparation; detoxification of mesencephalon (midbrain). Synchronisation of organ and tissue functions.