



Narodowe Centrum Edukacji Żywieniowej



TYPE 2 DIABETES

Type 2 diabetes is a metabolic disease characterised by elevated blood glucose levels due to impaired cellular sensitivity of cells to insulin, leading to impaired insulin secretion. If untreated, the disease leads to abnormal function of many organs and systems, e.g. eyes, heart, kidneys. Improper eating habits and low physical activity are important factors in the development of type 2 diabetes.

Diabetes mellitus is diagnosed when:

- there are symptoms of hyperglycaemia and a casual glycaemia ≥ 200 mg/dl (≥ 11.1 mmol/l)
- twice measured fasting glycaemia was ≥ 126 mg/dl (≥ 7 mmol/l)
- glycaemic level is ≥ 200 mg/dl (≥ 11.1 mmol/l) in the 120th minute of the glucose load test
- hemoglobin A1c level is $\geq 6.5\%$

Diet

Lifestyle modification plays a fundamental role in the treatment of type 2 diabetes. In diet therapy, it is recommended to follow the principles of healthy eating, i.e. regular meals, wholesome meals, limiting simple sugars and fats of animal origin and increasing the amount of whole grain cereal products, vegetables and fruit in the diet. At the same time, the diet should be individually adjusted to the patient's needs. To achieve this, consulting a dietitian can be helpful in supporting dietary habit changes.



Key recommendations

1

If you are overweight or obese, try to gradually reduce your body weight. This will benefit the insulin sensitivity of the tissues and the functioning of the whole body. A reduction of as little as 5% of body weight is associated with metabolic benefits, but optimally it should reach at least 7%. The diet should be tailored individually to the patient; it is advisable to consult a dietician for this purpose.

2

Consume meals regularly, every 3-4 hours, with the last one at the latest 2-3 hours before bedtime.

3

Avoid eating between meals. This also applies to drinking liquids that bring energy, e.g. coffee with milk and/or sugar, sweetened teas and drinks. Any snack or sugary drink will cause an increase in blood glucose and consequently an increase in insulin. Persistent hyperinsulinemia means that tissues are constantly exposed to insulin, which adversely affects their sensitivity. In addition, hyperinsulinemia increases appetite, which can make weight reduction difficult.

4

Compose your meals according to the Healthy Eating Plate. Try to have around half of your plate at breakfast, lunch and dinner occupied by fruit and vegetables, which are a source of dietary fibres, vitamins and antioxidant compounds. The total daily intake should be min. 400 g (in the ratio $\frac{3}{4}$ vegetable and $\frac{1}{4}$ fruit). Eat a variety of vegetables as often as possible, preferably raw or cooked al dente (keeping them slightly firm).

5

Eat fruit in smaller quantities as they contain more simple sugars. Choose underripe, less sweet ones and eat them raw if possible. Berries such as blueberries, raspberries and strawberries are particularly recommended. Fruits such as banana, mango, melon do not need to be eliminated from the diet. Try to combine fruit with foods that provide protein and/or fat, which delay gastric emptying, thus prolonging digestion time and preventing a rapid rise in blood glucose and insulin levels after a meal. For example: a handful of raspberries + natural yoghurt + a handful of nuts/ seeds, or peaches with cottage cheese wrapped in whole-grain pancakes. Alternatively, fruit can be a healthy dessert immediately after a larger, whole-food meal.

6

Products that are a source of carbohydrates (pastry, groats, rice, pasta, cereal flakes and potatoes) should be part of most meals and take up about one quarter of the plate. It is recommended to choose whole grain cereal products. They are a source of dietary fibre, B vitamins and many minerals. Wholemeal cereal products are digested slowly, which prevents a rapid rise in blood glucose and insulin levels.

7

Products that are a source of protein (meat, fish, eggs, milk and dairy products, and legumes) should occupy about $\frac{1}{4}$ of your plate, preferably at every meal. Choose lean meats and skimmed dairy products. Replace meat once or twice a week with fish and at least once a week with legumes. Eat red meat occasionally, no more than 350-500 g per week, and limit processed meats (cold cuts, sausages, pâtés, offal products, etc.) to amounts as small as possible.

8

Eat 2 portions of natural dairy products every day, preferably fermented, which are a good source of protein and calcium (1 portion is, for example, 1 cup of yoghurt). Choose low-fat products, containing a maximum of 3% fat. Make sure that they do not contain additives such as sweet fruit mousses or chocolate.



9

Products that are a source of fat are also part of a complete meal, but should be added in small amounts, which is why they are placed next to the Plate image. Mainly recommended products are: vegetable oils (canola oil, olive oil), nuts, seeds, avocados, that are rich in unsaturated fatty acids with have an anti-inflammatory effect. Products that are sources of saturated fatty acids, e.g. fatty meat, full-fat dairy products, or butter, should be limited.

10

Choose colourful fruit and vegetables, whole-grain cereals, nuts and oil, which are rich in polyphenols. These are antioxidant ingredients that have a positive effect on tissue insulin sensitivity.

11

Limit your consumption of sweets and products that contain sugar. Pay attention to labels and choose products with reduced or no sugar content. Sometimes sugar can be replaced by sweeteners in such products. Research indicates that natural sweeteners (such as stevia, xylitol) can have a positive effect on health through their antioxidant effects. In contrast, research on artificial sweeteners (sucralose, acesulfame K) indicates their potentially adverse effects on the composition of the microbiota, so their regular consumption is not recommended.

12

Drink at least **1.5-2 litres of fluids per day**. Replace sweetened drinks with liquids without added sugar, especially water, and light teas and herbal infusions. Take care to hydrate regularly by drinking small portions throughout the day.

13

The way in which meals are prepared and composed affects the rate of digestion and thus the rate at which blood glucose and insulin levels rise after the meal. Therefore, avoid chopping and overcooking food. On the other hand, the rate of increase in postprandial glycaemia will be positively influenced by:

- composing meals according to the Healthy Eating Plate,
- the presence of fermented and/or pickled products in the meal,
- refrigeration of cooked products that are sources of complex carbohydrates (groats, rice or potatoes), resulting in the formation of resistant starch,
- eating meals slowly in peace.

14

You could try starting your meal by eating vegetables first, then eating foods that are sources of protein and fat, and reaching for carbohydrate foods at the end. This order will promote a lower postprandial glycaemia than if you eat carbohydrates at the beginning of the meal.

15

If you use salt, do not exceed the recommended daily amount of 5 g (approx. 1 flat teaspoon). This amount also includes salt contained in foods such as bread, cheese, cold cuts and salty snacks. Iodised salt can supplement iodine in the diet, so there is no need to eliminate it completely.

16

If you are considering an alternative diet, consult your dietitian and/or your attending physician.

Long-term adherence to a low-carbohydrate diet based on animal products (in which carbohydrates realise less than 45% of dietary energy, and especially if the total carbohydrate content is <130 g/day) may increase the risk of developing cardiovascular disease and cancer. A diet with an increased protein content may promote weight loss in the short term, as it will be associated with a greater satiety feeling. However, protein is also a nutrient that stimulates insulin secretion, so long-term use of a high-protein diet may negatively affect glycaemic control.



Physical activity

- 1 Ensure regular physical activity. It provides a number of benefits for the body, including helping to achieve and maintain a healthy body weight, increasing tissue sensitivity to insulin, and being an important part of preventing the development of many diseases. Try to be active for at least 30 minutes every day. Adjust the type of physical activity to your abilities. Remember that simple activities such as walking, climbing stairs, active housework or active play with children also have health benefits.

Other lifestyle elements

- 1 **Eliminate alcohol from your diet.** Drinking alcohol with a meal increases postprandial glucose concentrations and thus increases insulin concentrations.
- 2 **Give up smoking.** Smoking cessation reduces the risk of heart attack and stroke, among other.
- 3 If you are exposed to stress, work out how to cope with it. Relaxation techniques based on mindfulness and meditation, breathing exercises or yoga can be useful.
- 4 Ensure adequate quality and quantity of sleep (7-8 hours a day). Try to go to bed and get up at regular hours. Don't use electronic devices (phone, tablet, computer, TV) an hour before bedtime, which will make it easier for you to fall asleep.
- 5 If you are taking metformin monitor your blood levels of vitamin B12.










Literature:

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Recommended and not recommended products in type 2 diabetes

Remember that the entirety of your diet, the composition of individual meals and the quality of the products you choose is important. The table below contains examples of products that should be the basis of your diet and those that you should keep to a minimum. These are guidelines for changing your eating habits for the better.

Product group	Recommended	Not recommended
Vegetables 	<ul style="list-style-type: none"> all fresh and frozen 	<ul style="list-style-type: none"> vegetables with fatty sauces, roux
Fruit 	<ul style="list-style-type: none"> all fresh and frozen dried fruit in moderation 	<ul style="list-style-type: none"> candied fruit fruit in syrups
Grain products 	<ul style="list-style-type: none"> wholemeal flours whole wheat and graham bread natural cereal flakes: oat, barley, spelt, rye wheat bran, rye bran, oat bran groats: buckwheat, barley pearl, bulgur, quinoa rice: brown, wild, red whole wheat pasta: wheat, rye, buckwheat, spelt 	<ul style="list-style-type: none"> refined flour confectionery, light breads (toast, Kaiser rolls, bread, bread rolls) breakfast cereals with added sugar (corn, chocolate, muesli, crunchy) small groats: couscous, semolina, cornmeal white rice light pasta: wheat, rice noodles
Potatoes 	<ul style="list-style-type: none"> cooked baked 	<ul style="list-style-type: none"> potatoes with fatty additives like cream or butter fried chips, crisps deep-fried potato pancakes
Milk and dairy products 	<ul style="list-style-type: none"> reduced-fat milk (up to 2%) dairy products: natural (no sugar added), fermented, up to 3% fat (e.g. yoghurt, kefir, buttermilk, skyr, grain cheese, soured milk). lean and semi-skimmed cottage cheese mozzarella light cheese for sandwiches in moderation 	<ul style="list-style-type: none"> whole milk condensed milk cream, coffee creamer fruit yoghurts with added sugar, dairy desserts cheeses: full-fat cheese, cheese spread, feta-type cheeses, soft cheeses such as brie, camembert, roquefort, full-fat mozzarella, mascarpone
Meat and meat products 	<ul style="list-style-type: none"> lean meats without skin: veal, chicken, turkey, rabbit lean beef and pork (e.g. loin, tenderloin) in moderation lean cold cuts, preferably home-made: tenderloin, cooked ham, poultry cold cuts, roast loin, roast turkey/chicken breast 	<ul style="list-style-type: none"> fatty meats: pork, beef, mutton, goose, duck fatty cold cuts (e.g. gammon, salami, brawn, bacon, spam) canned meats, offal meats, pâtés, hot dogs, kabanos, sausages
Fish, fish products and seafood 	<ul style="list-style-type: none"> lean or fatty sea and freshwater fish (e.g. cod, sole, hake, blue grenadier, pikeperch, bream, perch, mackerel, salmon, halibut, carp) herring and other fish in vegetable oils, smoked fish in moderation 	<ul style="list-style-type: none"> canned fish
Eggs 	<ul style="list-style-type: none"> soft boiled, hard boiled, poached eggs, scrambled eggs and omelettes fried with little or no fat 	<ul style="list-style-type: none"> eggs fried in large amounts of fat (e.g. butter, bacon, ard, salo (slanina)) eggs with mayonnaise
Fats 	<ul style="list-style-type: none"> olive oil, canola oil, linseed oil blends of butter and vegetable oils without palm oil in their composition soft margarines 	<ul style="list-style-type: none"> butter and clarified butter lard, bacon, tallow hard margarines (blocks) tropical oils: palm, coconut mayonnaise

Recommended and not recommended products in type 2 diabetes



Product group	Recommended	Not recommended
Насіння бобових та продукти з них 	<ul style="list-style-type: none"> all, e.g. soybeans, chickpeas, peas, lentils, beans, broad beans legume spreads soy flour, soy drinks with no added sugar, soy preparations: tofu, tempeh pasta made from legumes (e.g. beans, peas) 	<ul style="list-style-type: none"> low-quality ready-made legume preparations (e.g. soya sausages, breaded soy cutlets, soya pâtés, veggie burgers) <p><i>*read labels, compare ingredients and pay attention to added sugar, salt and fat content.</i></p>
Nuts, seeds 	<ul style="list-style-type: none"> nuts (e.g. walnuts, hazelnuts) and almonds seeds (e.g. pumpkin, sunflower) 	<ul style="list-style-type: none"> nuts and seeds: salted, in chocolate, in caramel, honey, sprinkles, breadings
Sugar, sweet and salty snacks 	<ul style="list-style-type: none"> dark chocolate min. 70% cocoa natural yoghurt with fresh fruit natural sweeteners (e.g. xylitol, stevia, erythritol) fruit purees, mousses, sorbets, jams without added sugar in limited quantities as part of a meal jelly and kissels with no added sugar home-made baked goods with no added sugar 	<ul style="list-style-type: none"> sugar (e.g. white, cane, brown, coconut) honey, maple syrup, date syrup, agave syrup sweets with a high sugar and fat content (e.g. cakes, biscuits, chocolate bars, milk chocolate and white, halva, doughnuts, angel wings, sweets) high-sugar jams salty snacks (e.g. chips, salty sticks, crispy flakes, crackers, nachos, crisps)
Beverages 	<ul style="list-style-type: none"> water drinks with no added sugar (e.g. coffee, cereal coffee, teas, herbal and fruit infusions, kompots, cocoa) vegetable and fruit juices in limited quantities as part of a meal homemade unsweetened lemonade 	<ul style="list-style-type: none"> alcoholic beverages sweetened carbonated and non-carbonated drinks energy drinks nectars, high-sugar fruit syrups drinking chocolate
Spices and sauces 	<ul style="list-style-type: none"> fresh and dried single-ingredient herbs (e.g. basil, oregano, turmeric, cinnamon, ginger), herbes de Provence spice blends without added salt homemade salad dressings based on a small amount of oil or yoghurt, herbs, lemon 	<ul style="list-style-type: none"> salt (e.g. table salt, Himalayan salt, sea salt) in excess* spice mixtures containing a high proportion of salt bouillon cubes liquid flavour enhancers prepared sauces <p><i>*explanation in point 15</i></p>
Soups 	<ul style="list-style-type: none"> soups with vegetable or lean meat broth whitened with milk up to 2% fat, yoghurt 	<ul style="list-style-type: none"> soups with fatty meat broth with roux, whitened with sour cream instant soups
Prepared meals 	<ul style="list-style-type: none"> mix of frozen fruit and vegetables mixtures of groats and legumes creamy soups ready-made stir-fry vegetable dishes salt-free vegetable pastes and purees <p><i>*read labels, compare ingredients and pay attention to added sugar, salt and fat content.</i></p>	<ul style="list-style-type: none"> fast food (e.g. toasted open-faced sandwiches, hot dogs, hamburgers, kebabs) frozen pizza and toasted open-faced sandwiches ready-made foods in bread crumbs, in fatty sauces, in refined flours instant oatmeal instant dishes (e.g. sauces, soups)
Technological processing of food 	<ul style="list-style-type: none"> cooking in water, steaming (products cereals, vegetables cooked al dente) barbecue (electric grill, grill pans) baking in foil, parchment paper, roasting sleeve, ovenproof dish fat-free frying stewing without pre-frying <p><i>*occasionally you can use a small amount of the recommended vegetable fat, e.g. olive oil or canola oil.</i></p>	<ul style="list-style-type: none"> deep-frying stewing with pre-frying baking with a lot of fat breading



Example of a quality menu in type 2 diabetes

BREAKFAST:

Sandwich with fish and cottage cheese spread and vegetables

- graham roll
- canned tuna, in water
- cottage cheese
- natural yoghurt up to 3% fat
- half a plate of your favourite vegetables (e.g. tomato, onion, bell pepper)

LUNCH:

Salad with mozzarella cheese

- iceberg lettuce
- tomato
- olives
- olive oil
- mozzarella cheese
- wholemeal rye bread

DINNER:

Baked salmon with groats and salad

- buckwheat groats
- paprika, granulated garlic, herbes de Provence
- black pepper
- carrot
- apple
- canola oil
- lemon juice



AFTERNOON SNACK:

Yogurt with oatmeal and additions

- wheat bran
- natural yoghurt
- lingonberry
- walnuts

SUPPER:

Vegetable stew with groats

- pearl barley groats
- chickpeas
- tomato
- courgette
- onion
- garlic
- canola oil
- natural yoghurt up to 3% fat
- dried herbs: oregano, basil

