WHAT TO EAT IF DIAGNOSED WITH TYPE 1 DIABETES?

Many factors affect blood glucose levels (glycaemia). If a patient aims for optimal glycaemic control, then diet plays a major role. Patients should be informed of the role of diet and about dietary options on how to improve glycaemia from the day of diagnosis. Dietary options can be provided by a medical doctor and/or nutritional therapist. The patient can choose the most suitable option, and then continuously optimise their glycaemia based on self-monitoring of blood glucose.

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Type 1 Diabetes (T1D) is characterised by the destruction of beta cells in the pancreas. When the pancreas is no longer able to produce sufficient insulin, the patient must inject replacement insulin. Insufficient insulin results in excessive blood glucose (hyperglycaemia) and a tendency towards life-threatening metabolic disturbance (ketoacidosis). The goal of therapy is a good glycaemic control – see table.

Blood pressure (<130/80), total cholesterol (<4.5 mmol/l, <173 mg/dl), LDL-cholesterol (<2.5 mmol/l, <96 mg/dl, or reduction by 50 %), HDL-cholesterol (men >1 mmol/l or >39 mg/dl, women >1,2 mmol/l or >46 mg/dl), waist circumference (women <80 cm, men <94 cm), and total insulin dose in 24 hours (<0.6 IU/kg body weight) are also important.

EVERY PATIENT WITH TYPE 1 DIABETES HAS A RIGHT TO NORMAL BLOOD GLUCOSE.

NEW FINDINGS IN RECENT YEARS

Since 2010, several studies have been published which have led to amendments of clinical guidelines in the United Kingdom, Sweden, Canada, Australia or USA. This article focuses on diet in T1D, but it is important to also take account of studies in Type 2 Diabetes (T2D), which use a low energy diet or a low carbohydrate diet to achieve a remission of T2D. Some patients with T1D also suffer from insulin resistance typical for T2D (so called double diabetes). New findings about the beneficial role of a very low carbohydrate (ketogenic) or vegetarian diet in T1D are also important.

CZECH CLINICAL GUIDELINES AND DIET IN DIABETES

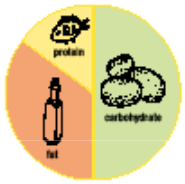
The Czech Diabetology Society (CDS) lists four types of diet: **balanced** (low fat), **vegetarian**, **low carbohydrate** and **Mediterranean**. CDS recommends a low fat diet, ie 44-60% of calories in carbohydrates, 20-35% in fat and 10-20% in protein, which also meets other criteria (fibre intake, cholesterol below 300 mg/day, saturated fats below 7 % of caloric intake etc.). For overweight and obese patients, including also those with T1D, it anticipates a weight reduction form of this diet, which reduces caloric intake by 500 – 1000 kcal/day. Vegetarian diet is mentioned as an alternative. A diet with low carbohydrate content (below 130 grams/day) is not recommended. Mediterranean diet is mentioned, along with low fat and low carbohydrate diets, in the context of similar weight loss results.

Indicator	Adults w T1D	Children w T1D	Healthy people
Glycated hemoglobin	< 45 mmol/mol	< 48 mmol/mol	< 39 mmol/mol
Fasting glucose (venous)	< 6.0 mmol/l	4.0–7.0 mmol/l	< 5.6 mmol/l
Selfmonitoring (capillary blood)			
fasting	4.0–6.0 mmol/l	4.0–7.0 mmol/l	< 5.6 mmol/l
after meal	5.0–7.5 mmol/l	5.0–9.0 mmol/l	< 7.0 mmol/l
before sleeping	–	4.0–7.0 mmol/l	< 7.0 mmol/l
at night	–	4.5–7.0 mmol/l	< 7.0 mmol/l

MAIN DIETARY PATTERNS FOR PATIENTS WITH T1D

According to the knowledge as at 2020, all four diets listed above can be successfully used in the therapy of T1D. The key is whether a diet suits the patient in the long run, and if they are able to achieve optimum glycaemic control and also prevent unfavourable changes in body composition, especially fat gain. All these diets eliminate or significantly reduce the consumption of foods with added sugars, refined carbohydrates, refined oils and additives (ultra-processed food products, UPFPs), fast food, instant meals, semi-finished products, ready meals and canned products. They promote whole or minimally processed foods and homemade meals that are locally and seasonally sourced.

BALANCED/ MEDITERRANEAN DIET



A balanced diet includes a wide variety of foods, usually contains about 200-250 grams of carbohydrates per day which should be split into at least five smaller meals throughout the day. To achieve weight (fat) loss, caloric intake should be tracked. It can be based on the so called Mediterranean Diet which includes quality whole grain bread, pasta, plenty of vegetables and some fruit based on seasonal availability. Leafy vegetables are part of every meal. The diet is rich in legumes, green beans, peas, nuts and olives. Dairy products, notably soured or fermented, are eaten daily, and fish at least 2-3 times per week. Herbs,

spices such as thyme, basil, oregano, garlic, onion and fresh lemon juice are used to add flavour. The Mediterranean Diet can contain more fat (up to 42% of calories), with quality olive oil being the major source. Rapeseed (Canola) oil is close to olive oil in composition. Modern medical therapy (types and dosing of insulin, sensors, pumps etc.) facilitates good glycaemic control, but requires significant effort and caution when estimating carbohydrate content and insulin doses.

VEGETARIAN DIET

A vegetarian diet has a favourable effect on blood cholesterol, but a higher carbohydrate content (up to 320 grams), which should be split into smaller portions per day (5-7 meals). It contains whole grains and legumes (soy, beans and lentils), nuts and seeds. It is rich in vegetables and fruit - patients with T1D should eat fruit in moderation. The diet contains no meat, and therefore has less fat (notably saturated fat) than a balanced diet. It includes eggs, dairy and fish in moderation. A well formulated diet contains sufficient protein, with potatoes, tofu, tempeh, quinoa, lupini beans, hemp, legumes, nuts and pumpkin seeds considered good plant sources. A stricter form excludes fish and seafood. Monitoring and adequate supplementation of key vitamins and minerals, notably iodine, zinc and vitamin B12 may be required. A Vegetarian diet requires diligent carbohydrate counting and accurate estimates of insulin dosing.

LOW CARBOHYDRATE (KETOGENIC) DIET

Low carbohydrate diets (<130g of carbohydrate/day) are one of the dietary options in diabetes treatment. A stricter form (30-50 g/day) is also called a ketogenic or very low carbohydrate diet. Provided there is sufficient intake of protein and fat, it will not lead to malnutrition or starvation. This diet can be used for weight loss and because of the satiety provided, this can be achieved without calorie counting. It is varied, tasty and is not a limitation for sports. It replaces bread, potatoes, rice, pasta or dumplings with vegetables (raw, fermented or cooked). It is rich in animal and plant sources of protein and fat (meat, fish, eggs, dairy, nuts, seeds, butter, lard, and quality plant oils). Insulin doses are typically reduced - a doctor will advise on medication changes. Benefits include: Near normal glycaemia, lower insulin doses before meals, lower total daily dose of insulin, a reduction in hypoglycaemic events and lower glycaemic variability. Basal insulin typically remains unchanged. The risk of ketoacidosis is not greater. "Dr. Bernstein's Diabetes Solution", which is linked with exceptional glycaemic control in both children and adults (HbA1c 38.5 mmol/l or 5.7%), suggests 30g of carbohydrate/day, (6g for breakfast, 12g for lunch and 12g for dinner, with the same amount of protein each meal). In overweight and obese patients, a low carbohydrate diet leads to a spontaneous reduction of caloric intake and weight, which facilitates reduction of basal insulin. There are contraindications (eg. fat metabolism disorders), and the lipid profile can worsen in a small cohort of patients. Excessive consumption of protein should be avoided. An advantage of a less strict diet (60-130 g/day) is a more varied menu and easier implementation. Since 2019, paediatric diabetologists in the Czech Republic advise a low carbohydrate diet (100 g/day) as an option for children with T1D – however, they do not recommend a stricter carbohydrate restriction.

diet	balanced	vegetarian	low carbohydrate
breakfast	sourdough bread, cottage cheese spread/ eggs/ham, vegetables	porridge oats soaked in water, seeds, nuts, sourdough bread, legumes spread, vegetables	egg omelette with ham and cheese cooked in butter, vegetables, unsweetened (natural) yoghurt with nuts and fruit, low-carb bread with vegetables
snack	unsweetened (natural) yoghurt with nuts and fruit, vegetables, cheese, a slice of bread	vegetable salad with seeds, unsweetened (natural) yoghurt with nuts and fruit	
lunch	vegetable/legume soup or meat broth, fish/meat/ cheese/ legumes, potatoes/pasta/rice/bulgur/ millet/buckwheat/ groats, mushrooms, vegetables, fruit	vegetable or legume soup legumes, tofu, tempeh, seitan, cheese, fish potatoes/pasta/rice/ bulgur/millet/buckwheat/ groats, mushrooms, vegetables, fruit	vegetable/legume soup or meat broth, fish/meat/ cheese, mushrooms, vegetables, fruit
dinner	fish with vegetables and side dish, sandwich with vegetables, vegetable salad with cheese	whole grain pancakes / sandwich with vegetables, vegetable-legume soup, vegetable salad with cheese	fish/meat/cheese/egg, vegetable salad, low carb bread with avocado
occasional dessert	panna cotta without sugar with strawberries, 70% chocolate, fruit	panna cotta without sugar with strawberries, 70% chocolate, fruit	panna cotta without sugar with strawberries, 70% chocolate, berries, protein ice-cream

TIPS FOR BETTER GLYCAEMIC CONTROL

Irrespective of the type of diet picked by the patient, there are simple tricks how to improve glycaemia:

Food order. The order of foods in a meal matters. Glycaemia is better when the meal starts with vegetables and foods high in protein and fat. Foods with carbohydrates should come later. A similar, but less pronounced effect, is seen after adding lemon juice or unsweetened vinegar to meals.

Glycaemic index (GI). Foods with a low GI have a lower impact on post meal glycaemia. Food processing and culinary preparation may increase the GI.

Physical activity after meals. Including a 30-min walk after a meal can significantly mitigate the increase in glycaemia. The planning of physical activity after meals requires careful reduction of bolus insulin to avoid hypoglycaemia. Appropriate physical activity is generally helpful.

Meal frequency. Unless hungry, there is no need to eat 5-6 times per day. Insulin must be adjusted to avoid hypoglycaemia and other undesirable effects.

Fasting. Can be particularly useful in weight reduction, but also in lowering blood glucose. There are a number of different forms. Medication must be amended, and a consultation with a medical doctor is necessary. Fasting can also be used to estimate the correct dose of long-acting (basal) insulin.

Timely insulin application. Glycaemia after meals is greatly affected by timely application of insulin before meals (with most current insulin products roughly 10-15 min), and containing carbohydrates. In a mixed meal, which contains carbohydrates with protein and fat, "fat-protein units" should be factored into the insulin dose calculations. A sensor can provide a timely warning.

Dairy products. Many patients see an unusual increase in glycaemia after consuming dairy products for breakfast, but not after consuming them in the afternoon. A glucometer or a sensor can point to a better timing. DIA

Credit: Abbott Czech Republic. Beating Diabetes with Food (Vyjídák, Krejčí, Zákostelecká, 2020). Dr. Troy Stapleton MBBS FRANZCR

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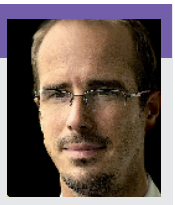

Solicitor and independent Management Consultant in the field of patient outcomes and process improvement in healthcare. He studied medical law and international health management in the United Kingdom. Since 2009, he has focused on evidence based medicine and nutrition, healthcare data, clinical and epidemiological studies and also on healthcare innovation and healthcare systems. He has been collaborating with Czech and Slovak medical doctors in a healthcare think-tank Globol. He co-founded Neslazeno.cz.

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