

Nutrition for Diabetes Mellitus

Dietetics



Beter voor elkaar

Nutrition for diabetes mellitus

1. What is diabetes mellitus?

Diabetes mellitus is a condition in which there are problems in maintaining blood glucose levels. Glucose is derived from carbohydrates (sugars and starch) in the diet.

Carbohydrates are converted in the intestinal tract into glucose. Glucose enters the blood through the intestinal wall.

The blood brings glucose to the cells in the body (for example, the cells in the muscles and the brain).

There, glucose serves as a source of energy.

In order to enable glucose to go from the blood and enter the cells of the body, insulin is required. Insulin is a hormone; it is made in the pancreas. In diabetes mellitus type 1, there is a shortage of insulin or insulin is even no longer produced at all by the pancreas.

In diabetes mellitus type 2, insulin does not work properly. It may be that insufficient insulin is being produced or that the body is insensitive to the insulin that is being produced (this is often the case with obesity).

The result is that the glucose cannot enter the cell and remains in the blood. The kidneys then excrete some of the glucose with the urine.

However, some remains in the blood. Too much glucose in the blood causes physical complaints such as fatigue, thirst, itching and frequent urination.

The treatment of diabetes mellitus type 1 consists of the use of insulin (administered with a pen or pump) combined with nutritional advice.

The correct amount and type of insulin along with proper nutritional advice helps to normalize blood glucose levels.

The treatment of diabetes mellitus type 2 consists of the use of pills and/or insulin, combined with nutritional advice.

The correct amount and type of pills and/or insulin along with proper adherence to the nutritional advice helps to normalize blood glucose levels.

The treatment of diabetes is aimed at keeping the amount of glucose in the blood within the normal limits.

The target values are between 4.4 and 8.0 mmol/l.

There are some factors that may affect blood glucose levels in addition to nutrition. These include stress, pregnancy, fever, illness and side effects of certain medicines (birth control pills, corticosteroids such as prednisone, diuretics). These factors may have an enhancing effect on the blood glucose-levels. Exercise can, on the other hand, lower the blood glucose level.

Make sure you have a healthy body weight

A healthy weight is very important. If you are overweight, the insulin may not work properly. As a result, blood glucose levels remain too high.

Together with the dietician, you can decide what a healthy weight is for you. To lose weight, it is important to change your eating habits. You will have to eat fewer calorie-rich products, such as sweet and savoury snacks, fatty foods, sugar, soft drinks and alcoholic beverages. The amount of energy is indicated in kilocalories: 1 kilocalorie (kcal) = 4.2 kiloJoules (kJ).

Good nutritional advice is not one-sided, but includes a varied diet. Such nutritional advice ensures that an eating pattern can be maintained for a long time. This makes it easier to get used to different eating habits. More exercise is necessary for weight loss and stimulates the functioning of insulin in the body. This helps to lower the blood glucose levels. You can try to exercise intensively five times per week for at least an hour. Choose a form of exercise that you enjoy (biking, swimming, walking, aerobics etc.).

2. The nutritional advice

The basis of nutritional advice is a healthy diet. However, you need to pay extra attention to the carbohydrates and fats in the diet. Based on what you are used to eating and drinking, a dietitian can discuss with you what your eating pattern should be. Some guidelines are described below.

Divide the carbohydrates evenly throughout the day

Carbohydrates are a collective name for sugars and starches. Sugar are in candy and soft drinks, but also milk products, fruit and fruit juices contain sugar.

Starches are found in bread and bread products, potatoes, rice, pasta and legumes. Everyone needs carbohydrates. They provide us with energy to be able to function.

In the case of diabetes, it is important that these carbohydrates are distributed evenly throughout the day and that fluctuations in blood glucose levels are prevented.

In our food, there are various types of carbohydrates:

- starches in bread, potatoes, rice, pasta and legumes;
- lactose in milk, buttermilk, custard, yoghurt and potted cheese;
- Fructose in fruits and fruit juices;
- sugar in candy, soda, ice cream, cake, cookies, sweet sandwich fillings and sugar from the sugar pot.

Use sugar sparingly

Sugar is, like starch, a carbohydrate that is converted into glucose in the body. People used to think that those with diabetes mellitus should not use any sugar at all.

Nowadays, it is known that sugar in the diet (for example, in the form of a biscuit or sweet sandwich filling) is very possible. One has to take into account that sugar is a carbohydrate and therefore needs to be incorporated into the nutritional advice. Talk to your dietician about this.

Too much sugar is not good, that applies to everyone. Sugar supplies no other valuable nutrients to the body than calories. So be careful about the use of sugar and try to get used to a diet that is less sweet. For sugar in the coffee and tea, there are good alternatives in the form of sweeteners. These sweeteners are also processed into light soft drinks.

In addition, there are various “sugar-free” products available such as pastries, cakes and chocolate. These products do not contain regular sugar, but may contain other carbohydrates. Often, they also contain a lot of (saturated) fat. Use of these products is, therefore, not recommended. Fruit juices labelled as ‘unsweetened’ contain carbohydrates in the form of fructose.

You can use these fruit juices, but only in place of a portion of fruit. This also applies to milk or yoghurt drinks labelled ‘unsweetened.’ These contain carbohydrates in the form of lactose and must be used sparingly.

Use fats and fatty products in moderation

In diabetes nutrition, the amount of fat and the type of fat plays an important part. With diabetes, there is a greater risk of developing cardiovascular disease.

To avoid this, it is wise not to eat too much fat.

In addition, the type of fat is important. Saturated fat increases the risk of cardiovascular disease, while it is unsaturated fat that reduces this risk. Saturated fat is found in foods of animal origin, such as meat, milk and cheese, as well as in some vegetable (plant based) foods, such as coconut, cocoa and palm oil (commonly used in snacks, cookies and ready-made products). Therefore, it is preferable to choose the lean meats, low-fat or semi-skimmed milk products and cheese with a lower fat content. Unsaturated fats are in oil, low-fat and diet margarine, fatty fish and nuts.

Dietary fibre

A healthy diet contains sufficient fibre. Dietary fibre is the collective name for the indigestible components of the diet.

They occur only in plant (based) foods. Dietary fibre is extremely important. It softens the faeces, stimulates the bowels to move and shortens transit intestinal time. On the other hand, dietary fibre forms an excellent breeding ground for the bacteria needed to digest everything well.

The intake of carbohydrates in the intestine is delayed by the use of dietary fibre. This can slow down the increase in the blood glucose level. For example, a slice of white bread gives a greater and faster increase in blood glucose than a slice of whole wheat bread. Thus, (therefore) whole-grain bread is preferable. Eating dietary fibre can ensure that there is less fluctuation in the blood glucose levels during the day and provide better regulation of the Diabetes Mellitus.

3. How many carbohydrates should the diet contain in the case of diabetes?

The starting point for diabetes nutrition is to strive for a well-balanced eating pattern using the carbohydrates throughout the day. This usually fits with our daily Dutch diet with three main meals a day and sometimes a little snack with coffee and tea. The amount of carbohydrates someone needs is about 50% of the total diet and will therefore be different for everyone.

The distribution of carbohydrates throughout the day

The advice on the distribution of carbohydrates throughout the day depends on the therapy used to regulate the blood glucose level.

Guidelines for carbohydrate distribution

Therapy	Dietary advice
Nutritional advice	Regular distribution of carbohydrates
Blood glucose lowering tablets	Regular distribution of carbohydrates
Tablets + 1 x insulin	Regular distribution of carbohydrates
2 x daily insulin (administered with a pen)	Fixed distribution of carbohydrates is necessary. (It is preferable that you can count with carbohydrates). In addition, it may be necessary to have a snack between meals alongside of the three main meals.
Intensive insulin therapy (administered with pen or pump)	For specific guidelines see next page.

Specific dietary guidelines for intensive insulin therapy with pen or pump

If short-acting insulin is administered at every meal with an insulin pen or pump, it provides other dietary options:

A fixed amount of carbohydrates per meal is not necessary. There is the possibility of taking more or fewer carbohydrates per meal, provided that the amount of insulin is adjusted.

Regular distribution of carbohydrates throughout the day is then less necessary.

It is essential in this case that you can count with carbohydrates. Adjusting the amount of insulin can be done in consultation with the doctor or diabetes nurse and the dietician.

If you are fully familiar with diabetes self-regulation (insulin-carbohydrate ratio), you can then determine your insulin amount per meal yourself.

Please note:

'Extra' carbohydrates, for which additional insulin is injected, need not lead to high blood glucose levels. However, the energy (calorie) content of the diet does then increase.

As a result, body weight may increase, which is not always desirable.

4. What do you need every day?

For the groups of foods from the five principle ingredients of a proper diet, recommended amounts are prepared by age group and gender. That means: What do you need per day?

The recommended amounts indicate how much you need, on average, per day to get enough protein, vitamins and minerals. Per age group, the smallest amounts apply for girls/women and the largest for boys/men.

In all the quantities mentioned, it is the weight of products as they are eaten.

	19–50 years		51–69 years		70 years and older	
	Men	Women	Men	Women	Men	Women
Vegetables	250 g		250 g		250 g	
Fruit	2 pieces (200 g)		2 pieces (200 g)		2 pieces (200 g)	
Wholemeal bread	6–8 slices	4–5 slices	6–7 slices	3–4 slices	4–6 slices	3–4 slices
Wholegrain foods (such as rice, pasta, couscous) or potatoes	4–5 serving spoons (240–300 g)		4 serving spoons (240 g)	3–4 serving spoons (180–240 g)	4 serving spoons (240 g)	3 serving spoons (180 g)
Fish, meat, eggs, legumes (see table below)	1 portion		1 portion		1 portion	
Unsalted nuts	25 g		25 g	15 g	15 g	
Dairy products	2–3 portions (300–450 ml)		3 portions (300–450 ml)	3–4 portions (450–600 ml)	4 portions (600 ml)	
Cheese	40 g		40 g		40 g	
Oil and spreads	65 g	40 g	65 g	40 g	55 g	35 g
Fluids	1.5–2 litres		1.5–2 litres		1.5–2 litres	

5. Practical tips

With a fixed amount of carbohydrates per meal you can have a variation by replacing a food with another food containing around the same amount of carbohydrates.

In this list of variants, a number of carbohydrate-containing foods are indicated along with which other foods (with approximately the same amount of carbohydrates) you can replace them with. In addition, the amount of fat in the food is also taken into account. A number of variation options are included in this folder.

Bread

For 1 slice of bread (16 gram carbohydrates) you can substitute:

- 2 (whole wheat) rusks;
- 2 slices (brown) crispbread;
- 3 pieces of baguette bread (à 10 grams per piece);
- ½ raisin bun;
- 1 slice of currant or raisin bread;
- 1 dish of non-fat yoghurt or semi-skimmed milk with 1 tablespoon of muesli, cruesli or 2 tablespoons of cornflakes;
- 1 dish of porridge (150 ml) made with semi-skimmed milk without sugar.

Sweet sandwich spread

Ordinary jam for 1 slice of bread has about 10 grams of carbohydrates. Instead, you can also substitute (apple) spread, honey, fruit-flavoured sprinkles or marmalade. A portion of low-sugar jam contains 4 grams of carbohydrates. A portion of sugar-free jam contains 1 gram of carbohydrates. One serving of peanut butter contains 2 grams of carbohydrates for 1 slice of bread. Peanut butter is rich in healthy unsaturated fats. As an exception, you may choose chocolate sprinkles or chocolate spread. These products are rich in the less healthy saturated fats.

Savoury sandwich filling

Savoury sandwich fillings, such as meats and cheeses have almost no carbohydrates and therefore do not have an elevating effect on your blood glucose levels.

However, the full-fat variants are generally rich in the less healthy saturated fats. Therefore, preferably choose a lean variant such as 20+ or

30+ cheese or cheese spread, cottage cheese or lunch meats such as ham, roast beef, fricandeau and cured pork.

Milk and dairy products

For 1 glass (150 ml) of semi-skimmed milk (7 grams of carbohydrates), you can substitute:

- 1 glass of buttermilk;
- 1 dish (non-fat) yoghurt;
- 1 dish (non-fat) soft potted cheese.

Potatoes and substitutes

Potatoes and substitutes, such as rice and pasta, are the main carbohydrate suppliers of the main meal. Instead of 4 small potatoes (200 grams, about 32 grams of carbohydrates) you can substitute:

- 4 large spoonfuls of mashed potatoes;
- 3 large spoonfuls of cooked (whole grain) pasta such as macaroni and spaghetti;
- 3 large spoonfuls of cooked legumes such as brown beans, white beans, marrowfat peas, lentils;
- 2 large spoonfuls of cooked (brown) rice;
- 2 slices of brown or whole wheat bread;
- 6 pieces of baguette bread (à 10 grams per piece).

When we use the term 'large spoonful,' we mean a normally filled serving spoon.

Fruit

An average serving of fruit (15 grams of carbohydrates) may consist of:

- 1 apple, 1 orange, 1 pear, 1½ grapefruit, 2 nectarines, 3 mandarin oranges, 2 kiwis, 1 slice of fresh pineapple, 1 small bowl of cherries, 1 small banana, 3 plums, 7 apricots, 10 grapes;
- 1 glass (150 ml) of unsweetened orange juice or grapefruit juice;
- 1 small dish of fruit in light syrup;
- 1 small dish of fresh fruit (125 grams).

Desserts

For 1 small dish of custard without added sugar (e.g. Optimel) of 150 ml (14 grams of carbohydrates) you can substitute:

- 1 small dish of non-fat yoghurt or potted cheese (cottage cheese) with 1/2 portion of fruit or a small amount of fruit syrup concentrate;
- 1 large bowl of 200 ml non-fat fruit yoghurt without added sugar;
- 1 small dish of porridge without added sugar;
- 1 dish of non-fat yoghurt or potted cheese (cottage cheese) with 1 tablespoon of muesli, cruesli or 2 tablespoons of cornflakes;
- 1 popsicle/sorbet.

Snacks

As a snack (approx. 15 grams of carbohydrates,) you may choose:

- 1 slice of bread with low-fat margarine and low-fat savoury sandwich filling;
- 1 portion of fruit (see above);
- 1 pre-cut slice of whole wheat ginger cake;
- 2 whole wheat rusks;
- 1 Evergreen (= biscuit);
- 2 Sultanas [raisin biscuits];

As an exception:

- 1 slice of pound cake;
- 1 mini candy bar;
- 2 chocolates;
- 7 salty biscuits (such as Tuc);
- 2 tablespoons assorted nuts and raisins;
- 4 small rounds of Melba toast or 3 pieces of baguette bread (à 10 grams each) with, for example, vegetable salad, cheese or lunch meat;
- 1 small bag of crisps.

Beverages

Some beverages do not contain any carbohydrates. These include tea and coffee without sugar, light soft drinks, tap water, mineral water. For these beverages, there is no limit to how much you may drink. Also, you can have one glass of tomato juice or vegetable juice per day without having to omit anything. Broth and fat-free, clear soups are, with some exceptions, allowed due to the amount of salt.

Allowed without limits

The following products can be used without omitting anything else or injecting additional insulin and thus (therefore) have little or no effect on blood glucose levels:

- raw vegetables (such as carrots, tomatoes and cucumber);
- sugar-free chewing gum;
- tea / coffee without sugar;
- (mineral) water;
- light soda;

As an exception:

- broth or clear soup;
- cheese;
- meats and lunch meats;
- nuts.

Practical tips on weight loss

To add more variety to your diet, you can use the following selection table.

Product group	Preferably	Middle course	As an exception
Potatoes, rice, pasta, legumes	Boiled potatoes, legumes, whole wheat pasta, brown rice.	Mashed potatoes, couscous.	Pasta, white rice, French fries, pan-fried potatoes.
Bread	Whole grain bread, rye bread, whole wheat crispbread.	Brown bread, wheat bread, whole wheat rusks, crispbread, whole wheat raisin bread.	White bread, raisin bread, bread rolls, croissants, rusks, Melba toast.
Breakfast cereals	Products such as: Brinta, Bambix, whole wheat flakes, Weetabix, unsweetened Muesli.	Cruesli.	Cornflakes, rice crispies.
Vegetables	All kinds of fresh or frozen vegetables, in tins or glass pots.	Tomato juice.	Creamed vegetables.
Fruit	All kinds of fresh fruit.	Fruit juices (unsweetened).	Apple sauce, dried fruits.

Product group	Preferably	Middle course	As an exception
Milk and dairy products	Skimmed milk, buttermilk, non-fat yoghurt, non-fat potted cheese, semi-skimmed-milk, semi-skimmed unsweetened yoghurt.	Non-fat unsweetened yoghurt drink, non-fat, unsweetened custard, non-fat unsweetened fruit yoghurt.	Whole milk, full-fat yoghurt, full-fat custard, semi-skimmed and full-fat potted cheese, whipped cream, sour cream, crème fraiche.
Cheese	20+ and 30+ cheese/cheese spread, 45+ cheese spread, Camembert 30+, low-fat light fresh cheese (8%), fresh goat cheese, cottage cheese, mozzarella, Swiss cheese powder.	40+ cheese (Leidse, Frisian clove cheese), Edam, Camembert 45+, Brie 50+.	Gouda cheese 48+, hard goat cheese, Bluefort, Brie 60+, Kernhemmer, Gorgonzola, Gruyère, products such as: Boursin, cream cheese, Leerdam / Maasdam cheeses.
Eggs	Boiled eggs (Max 3 per week).		Fried eggs (Max 3 per week).

Product group	Preferably	Middle course	As an exception
Sweet sandwich filling	Jam, apple spread, honey, sandwich spread, vegetable spread, lunch salads (celery, fish and cucumber).	Fruit sprinkles, aniseed sprinkles, treacle, lunch salads (Egg, ham / leeks, chicken curry, meat).	Chocolate flakes, chocolate sprinkles, chocolate spread (milk, dark and hazelnut), coconut slices, peanut butter (light).
Meats	Chicken fillet, lean beef (steak, entrecôte, roast beef, stewing meat, lean beef), lean pork (fricandeau, lean ham, unbreaded schnitzel, pork tenderloin, pork fillet, pork steak, pork chops).		Chicken with skin, minced meat (all kinds), hamburger, lamb, braising steak, sausage, pork chop, bacon, breaded meat, bratwurst, smoked sausage.
Lunchmeat	Gammon and ham shoulder, smoked meat, roast beef, chicken fillet, fricandeau.	Beef tartar, smoked ham, low-fat cervelat.	All kinds of sausages such as baloney, cervelat sausage, salami, berliner sausage, smoked bacon sausage, liver sausage, pâté, bacon.

Product group	Preferably	Middle course	As an exception
Fish	Trout, gurnard, salmon, steamed mackerel, bass, cod, pollack, lemon dab/lemon sole, haddock, wolf fish.	Plaice, sole, tuna, smoked herring, pickled herring, salted herring, sardines.	Fish fingers, eel, fried haddock fillet, deep-fried squid, cod parings, crab, lobster, mussels, shrimps.
Meat substitutes	Tofu, Tempeh, Quorn pieces.	Vegetarian meatballs, hamburger, schnitzel.	Other vegetarian burgers.
Fats	Diet low-fat margarine, diet margarine, oil (all kinds), liquid baking and frying product, liquid deep-frying fat.	Low-fat butter, margarine.	Hard baking and pan-frying fats, hard fats for deep-frying, butter.
Sauces	Ketchup, curry, barbecue sauce.	Halvanaise, mayonnaise-based sauce for French fries 35%.	Mayonnaise, cheese sauces, cream sauces.

Product group	Preferably	Middle course	As an exception
Beverages	(Mineral) water, coffee, tea, light sodas.	Fruit juices (unsweetened).	Soft drinks, fruit drinks, alcoholic beverages.
Extras	Breakfast ginger cake, whole wheat biscuit, macaroon, spice cake, ginger cookie, café noir cookie, rice waffles, Evergreen, Sultana, chewing gum, boiled sweets, popcorn, Japanese mix, salty sticks, sorbet.	Sponge cake, treacle waffles, pound cake, fruit flan, butter cookies, mixed nuts*, mix of nuts and raisins, tortilla chips, olives, sorbet.	Chocolate, butter cake, cream cake, Dutch apple pie, almond paste filled cakes, chocolate covered nuts, mixed nuts, cheese biscuits, pizza, rolled sausage, croquets, sausages and sausage-roll, spring rolls, brick cheese, slice of sausage, ice cream.

Source: Analysis figures NEVO table 2011

Extras

Of course, it is possible to have a treat sometimes, like a biscuit, a piece of chocolate or a savoury snack such as a small bag of chips or a handful of nuts.

Consider in advance what you want and how much. This prevents you from eating more than you intended. Make an agreement with yourself about how often you want to eat something extra.

This can range from 3x a day to 1x a week, depending on what you are used to doing. This will make the diet more attractive and easier to maintain.

Tips for changing your eating habits

- Create a shopping list and buy no more than necessary;
- Do grocery shopping after eating, so with a full stomach;
- Get as few ready-made foods, sweets and snacks, as possible to keep in the house. The temptation to eat sweets is then not so great;
- Make sure that you eat at regular times and do not skip meals.

Tips for eating less

- Do not cook more than necessary, then you do not have to eat the leftovers;
- Eat slowly; take your time at the table. If necessary, lay down your cutlery until your mouth is empty again;
- Keep all food out of sight;
- Use smaller plates, glasses, bowls, etc.;
- Take small bites, chew the food well;
- Eat at fixed times and not in-between meals;
- Eat in a regular place, for example, at the dining table. Set the table for each meal;
- Eat consciously by doing nothing else while eating, such as reading or watching television;
- Do something fun at times when you always feel like eating something;
- Do not save any leftovers.

6. Eating out, partying, going out

When eating out or going to a party, the time of the meal is usually different from what you are used to. Often, somewhat more is eaten and meals can be a bit higher in fat content. You can then adjust the time of your insulin injection.

There are the following possibilities:

- Take your insulin injection at a later time and/or;
- Divide the evening insulin into two or more portions and/or;
- Inject extra units of insulin.
- Consult the diabetes nurse and dietician on what is most suitable for you. When you go out for dinner, wait to take your insulin injection until the main course is served. This will prevent a hypo (low blood glucose level) if you have to wait too long. You can also then better determine how many carbohydrates the meal contains and thus how much insulin you need to inject for it. If you decide to have a dessert, you could inject insulin separately for it.

It is advisable to check your blood glucose level when you come home or before you go to bed. Excessively high blood glucose levels (through additional food) can be adjusted with short-acting insulin. A hypo (during extra exertion (dancing) and alcohol) can be prevented by eating additional carbohydrates. How much that should be is decided in consultation with the diabetes nurse and dietitian.

Alcohol

Alcohol has a blood glucose lowering effect. The liver has a task in breaking down (metabolising) alcohol. When that is happening, there is no -- or insufficient -- glucose going from the liver into the blood.

When using insulin, especially after several drinks, it is possible that the blood glucose levels become too low (hypoglycaemia). Often one cannot judge whether the "dizziness" is derived from (too much) alcohol or if there is a hypo.

The blood glucose lowering effect may occur up to 24 hours after alcohol consumption. It may therefore be necessary to eat a small amount of carbohydrates. This could be, for example, 3 rounds of Melba toast or a few handfuls of crisps. There is no objection to drinking 1 to 2 glasses of alcohol a day -- just not every day.

Please note:

- Not on an empty stomach;
- Hard liquor (including gin, whiskey, cognac) contains no carbohydrates;
- (If necessary) eat extra carbohydrates (Melba toast, crackers, bread) when drinking alcohol;
- Before going to sleep, check your blood glucose levels;
- Beer, wine, sherry and port contain carbohydrates to a greater or lesser extent.
- Advice: Check the blood glucose before going to sleep. Alcohol after sports enhances the risk of hypo; before going to sleep check the blood glucose and, if necessary, eat extra carbohydrates;
- Alcohol-free beer contains more carbohydrates than ordinary beer. Drinking alcohol-free beer therefore increases the blood glucose level.

7. Exercise

For those with diabetes mellitus, regular exercise reduces the risk of cardiovascular disease. It improves the physical condition and overall well-being. However, for type 1 diabetics, blood glucose regulation becomes complicated by exercise. People with type 1 diabetes are very sensitive to all changes in insulin levels and the glucose supply and consumption. Through exercise it can be difficult to keep blood glucose levels stable. This is because exercise has a blood glucose lowering effect. This effect lasts 24 to 48 hours. However, with a correct adjustment of insulin dosage and carbohydrate intake, this can be compensated for.

Measuring your blood glucose level (before and after exercise) is essential for evaluating the effects of exercise, food and insulin dosage. How many carbohydrates and how much insulin is needed during a particular type of exercise can, in this way, be calculated. In this way, you learn how your body responds to exercise (see Table 1 for guidance). It is advisable to engage in exercise at the same time of day.

Table 1: Policy Guidelines for Exercise

Duration and type of exercise	Blood glucose level before exercise	Insulin adjustment before exercise	Extra carbohydrates
<30 minutes of light exercise	<5 mmol/l >5 mmol/l	Half Normal dose	10–15 grams none
30–60 minutes of moderate exercise	<5 mmol/l 5–10 mmol/l 10–15 mmol/l	Skip Half of Normal dose	30–45 grams 15 grams none
> 1 hour moderate exercise	<5 mmol/l 5–10 mmol/l 10–15 mmol/l	Skip Half Half	45 grams/hour 30–45 grams/hour 15 grams/hour

As a rule of thumb, the following may apply: Inject half of the short-acting insulin during the meal which is eaten less than 2 hours before exercise. In addition, inject the insulin into a place that is the least actively moving during the exercise, for example in the abdomen instead of in the leg if you are running. For exercise that takes place more than 2 hours after the meal, the normal dose of short-acting insulin can usually be injected. If necessary, eat extra food before and after exercising. The latter, especially applies for exercise that lasts longer than 1 hour.

After exercise, hypoglycaemia can still occur in the recovery phase due to the increased insulin sensitivity (type 2 diabetes) and due to glucose consumption of the muscles. It may then be necessary to also inject less than the usual dose of insulin during the meal afterwards and also to use a lower dose of long-acting or pre-mixed insulin in the evening / for the night. How much less varies per person. Depending on the nature of the exercise, additional carbohydrates (energy drinks or dextrose) must be used before, during and/or after exercise.

8. Hyper / hypo

Hyperglycaemia means that the blood glucose level is too high. You can recognize hyperglycaemia by the following characteristics: drowsiness, tiredness, dry tongue, frequent urination and the need to drink a lot.

With hyperglycaemia you can take various actions to reduce the blood glucose level, for example, drinking a lot of water or using extra short-acting insulin. Do not use extra short-acting insulin without the advice of the diabetes nurse.

In the case of hypoglycaemia, the blood glucose level is too low (less than 4 mmol/l). A hypoglycaemia can be expressed by: Dizziness, tremor, poor eyesight, sweating, hunger, paleness, fatigue, headache and mood fluctuations.

It is important that you take action immediately with low blood glucose levels. If you are not sure if the blood glucose is too low, it is advisable to check the blood glucose first. If the value does appear to be too low (below 4 mmol / l), you should then eat one of the following foods, which contain 'fast' carbohydrates:

- 6 grape sugar tablets / dextrose;
- 1 glass of coke (150 ml);
- 1 glass of fruit syrup with water (40 ml syrup);
- 3–4 sugar cubes.

It is also advisable, after eating a 'fast' carbohydrate-rich snack, to eat a 'slow' carbohydrate-rich snack, for example:

- 1 slice of brown bread with jam;
- 1 slice of ginger breakfast bread;
- 2 rusks with toppings.

If a hypoglycaemia occurs in the evening, it is advisable to check the blood glucose level before going to sleep, to prevent a blood glucose level that is too low during the night.

9. HbA1c

When taking a blood sample, the HbA1c is often also determined. Red blood cells contain haemoglobin and are in blood for approximately 2–3 months before they are broken down. In the blood, glucose can attach to the haemoglobin and not let go. This allows for a good estimate to be made of the average amount of glucose in the blood over 2–3 months: the HbA1c.

The aim for those with type 1 diabetes mellitus is to have an HbA1c below 48 mmol/l (old value 6.5 mmol/l).

Department of Dietetics

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More information

For more information, contact the Nutrition Centre Stichting Voedingscentrum Nederland [Netherlands Nutrition Centre]
PO Box 85700
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With questions about healthy nutrition, food safety, food quality, diets and food sensitivity, you can call 070 306 88 88 between 9:00 am and 5:00 pm on working days or send an e-mail to info@voedingscentrum.nl or seek contact via the contact form on the website www.voedingscentrum.nl

If you are looking for a book, brochure or leaflet about nutrition, please visit the web shop of the Nutrition Centre at the website above.

The Diabetes Vereniging Nederland [Netherlands Diabetes Association] also publishes various informational brochures and a journal, Diabc. This association also regularly organizes information gatherings about diabetes and everything that relates to it. Request more information at:

Diabetes Vereniging Nederland [Netherlands Diabetes Association]
Mailing address:
PO Box 470
3830 AM Leusden
Diabetes hotline available 24 hours a day:
Phone: (033) 463 05 66
For current information, please visit www.diabetesvereniging.nl

Other websites to be consulted:
www.idf.org (international diabetes federation)

Book:
'Kijk op koolhydraten', Nicoline Duinker–Joustra [Looking at carbohydrates]
ISBN: 90 6611 6641

This text was created by the Department of Dietetics of the Ikazia Hospital in Rotterdam (September 2011) using the following brochures and articles:

- Voedingscentrum 'Schijf van vijf'/ product nr. [Nutritional Centre: the five principle ingredients of a proper diet] 100, 2010;
- Voedingscentrum 'Eetabel', brochure nr. 806, 2009;
- Heeg, J.E., 'physical activity contributes to good regulation with type 2 diabetes', Diabetes Specialist, June 2008; ['lichaamsbeweging draagt bij aan goede regulatie type 2 diabetes'];
- 2010 Publishers, 'Diabetes Mellitus', Dietary Treatment Guidelines, 2010;
- NDF, "Nutrition Guidelines for Diabetes Types 1 and 2", 2010.



Let op: In deze folder staat informatie die belangrijk is voor u. Heeft u moeite met de Nederlandse taal? Lees deze folder dan samen met iemand die de informatie voor u vertaalt of uitlegt.

Please note: This leaflet contains information that is important for you. If you have trouble understanding the Dutch language, you should read this leaflet together with someone who can explain the information or translate it for you.

Dikkat: Bu broşür sizin için önemli bilgiler içerir. Hollandaca okumakta zorlanıyor musunuz? O zaman broşürü bilgileri sizin için çeviren ya da açıklayan biriyle okuyun.

Uwaga: Ta ulotka zawiera ważne dla Ciebie informacje. Masz trudności ze zrozumieniem języka holenderskiego? Przeczytaj tę ulotkę razem z kimś, kto przetłumaczy jej treść lub będzie w stanie wyjaśnić zawarte w niej informacje.

انتبه: هناك معلومات مهمة بالنسبة لك في هذا المنشور. هل تواجه صعوبة في اللغة الهولندية؟ اقرأ إذن هذا المنشور مع شخص آخر يترجم أو يشرح لك المعلومات.