



Useful Information about Diabetes

For those who want to keep their blood sugar under control.

Contents

Introduction	3
What is Diabetes?	4
Different Types of Diabetes	5
Waist Size and Type 2 Diabetes	8
High Blood Pressure, Hypertension	12
Treatment	14
Insulin	15
High and Low Blood Sugar	17
Self Care	19
Tips and Advice	21

Approximately 3–4% of the population in Sweden are living with diabetes, which makes it one of our most common diseases. In addition, many people have slightly increased blood sugar, which is something that increases the risk of developing the disease in the future.

One of the requirements for a long and safe life with diabetes is to be knowledgeable about the disease and how to manage it yourself. If you have diabetes, you have everything to gain by keeping your blood sugar level as normal as possible. We hope that you will find useful advice in this book to help you maintain the right balance.

What is Diabetes?

Diabetes, or *diabetes mellitus*, is actually not just one but several different diseases, with too high blood sugar as the common denominator. The word diabetes itself is Greek (*diabainein*) and means “something rushing through the body”. The word *mellitus* originates from the Latin word for “sweet as honey”.

Diabetes is a metabolic disease, which means that there is a dysfunction mainly in the way the body handles sugar (glucose) but also the fat that we eat. The reason for this is that the body is unable to produce a sufficient amount of the life-essential hormone called insulin.

Insulin is produced in islets cells in the pancreas where it secretes into the blood. It is very much like a key to open the fat and muscle cells in the body. Fat and sugar in the blood can then be absorbed by the cell and is stored to be used later as fuel. If there are not enough keys or the locks of the cells are not working properly, the level of sugar increases in the blood.

In healthy people, who do not have diabetes or are in a pre-stage of the disease, the sugar level in the blood is balanced. The sugar level in the blood

controls the production of insulin. If the blood sugar level goes up, e.g. after a meal when the nutrients have been absorbed from the intestines into the blood, the insulin-producing cells in the pancreas secrete extra insulin. The cells in the body absorb the sugar, the blood sugar drops, and the balance is restored.

This fine-tuned mechanism does not work when you have diabetes. But the reason for the disturbed balance is different for the different types of the disease. Diabetes is diagnosed if the glucose level goes above a certain level (7.0 mmol/l) on repeated occasions on an empty stomach.



Different Types of Diabetes

There are three different main types of diabetes:

- Type 1 diabetes
- Type 2 diabetes
- Pregnancy diabetes (gestational diabetes)

TYPE 1 DIABETES

The second most common form of diabetes is *type 1*. This was previously called juvenile diabetes, but the name is not entirely correct as people of all ages can get it. It is, however, more common in children and teenagers.

Type 1 diabetes is an *autoimmune disease*. This means that the body's own immune system, which is supposed to protect the body from infections, instead attacks and destroys the body's own insulin-producing cells in the pancreas. Type 1 diabetes must therefore always be treated with insulin, since the body does not produce any insulin on its own.

There are several theories behind the true cause of type 1 diabetes. Some theories are based on that people with a certain genetic (hereditary) background, under the influence of environmental factors and potentially also viral infections, develop this autoimmune disease. If you have a parent with

type 1 diabetes, the chance of getting diabetes increases by approximately 5%, and if you have an identical twin with the disease, you have a 30–50% chance of developing diabetes. If you do not have a relative with type 1 diabetes, the chance of getting the disease is approximately 0.3–0.4%.



The symptoms of the disease usually develop over a short period of time. *Increased thirst and urination, hunger, tiredness, headaches, weight loss and blurred vision* are typical symptoms.

If you have type 1 diabetes and do not get treatment with insulin on time, or if the treatment is insufficient, the condition can become so severe that you have to seek emergency medical care.

TYPE 2 DIABETES

Type 2 diabetes is the most common form of diabetes. This was previously called adult-onset diabetes, but the name is incorrect as people of all ages can get it, even though it is rare in children.

Approximately 85–90% of all patients with diabetes have type 2 diabetes. The disease is mainly caused by the locks on the cells not working properly. Sluggish locks create a resistance against letting sugar into the cells. This is called *insulin resistance*, which means that a larger amount of insulin is required to keep the blood sugar levels within normal limits.

At least four out of five patients with type 2 diabetes are overweight and insulin resistance is closely related to obesity. Amongst the severely overweight, about every third person gets diabetes.

Every Tenth Person is in the Risk Zone

Approximately ten percent of the population have insulin resistance. Not everyone will be affected by type 2 diabetes, since the body is usually able to compensate for the insulin resistance by producing more insulin.

Many people have higher insulin production than normal before they get type 2 diabetes. Finally, the insulin-producing cells are not able to produce the large amount of insulin that is

required. This is when the blood sugar level starts to rise and diabetes becomes a fact.

Why do you get Type 2 Diabetes?

Type 2 diabetes is hereditary to a high degree. Studies on identical twins, who share the exact same genes, show that if one twin gets type 2 diabetes, the other twin will also almost certainly get it.

The number of patients with type 2 diabetes is on the rise and there are two main reasons why this particular type of diabetes is increasing. One is that we live longer and diabetes becomes more common in old age. The other is our lifestyle. Too much food and too little exercise is the foundation for obesity and insulin resistance. Obesity increases the demands on the body's glucose



metabolism, which eventually fails with time. It is also harder to keep a normal, steady and low blood sugar level the older we get.

Many Swedish people have *pre-diabetes* or *latent diabetes*, which means that blood sugar levels are just under the limit for a diabetes diagnosis. Many diabetes experts say that this pre-stage to type 2 diabetes should also be treated.

The dysfunctional glucose metabolism is often accompanied by excess weight, high blood pressure and high levels of fat in the blood. All these symptoms are individually, but most of all in combination with each other, dangerous for the heart and the blood vessels.

Another risk factor is smoking. Nicotine contributes to insulin resistance and makes it harder for the body to metabolise sugar. It is a well-known fact that smoking also seriously damages the heart and the blood vessels.

Symptoms

Type 2 diabetes can develop slowly and may not cause any symptoms in the beginning. Over time, the increased blood sugar level will make you tired, susceptible to infections in your urinary tract system or genitals and will cause itchy skin, blurry vision, increased thirst, increased amounts of urine and weight loss.

PREGNANCY DIABETES

Pregnancy diabetes (gestational diabetes) is classed as a version of diabetes, since insulin production is not sufficient to meet the body's increased demands during pregnancy. Between two and three percent of all pregnant women get pregnancy diabetes. Usually this resolves quickly after the birth; however, the woman is at an increased risk of type 2 diabetes again at a later stage in life.



Waist Size and Type 2 Diabetes

The fat around your waist is often the basic cause of other risk factors for cardiovascular disease and type 2 diabetes. If you reduce the circumference of your waist you will probably also reduce other risk factors, such as increased levels of fat in the blood and blood sugar levels.

Why is Abdominal Fat More Dangerous than Other Fat?

Modern research has shown that it is abdominal fat, in other words the fat around your stomach, which really increases the risk of cardiovascular disease and type 2 diabetes. A good way to find out if you have too much abdominal fat is to measure the size of your waist. There is a clear connection between waist size, cardiovascular disease and type 2 diabetes. There are many indications that too much abdominal fat and a large waist size increase the *cardio-metabolic* risk. (Cardio means heart and metabolic means the breakdown and use of nutrients)

This is How you Measure Your Waist

To measure your waist is simple. You get your waist measurement by measuring the circumference of the stomach between the lower ribs and the up-

per hip bone with a regular tape measure. If you are a woman, your waist size should not exceed 88 cm. If you are a man, the limit is 102 cm. Your height does not matter, the limits are the same.



Reducing your waist size will reduce the amount of abdominal fat

The bottom line is that there are only two things that affect the size of your waist: How much you eat and how much you exercise. If you use more energy than you consume, you will eventually become slimmer. Unfortunately this is easier said than done. There are no miracle cures. It is better to make lifestyle changes that really work. This is a long-term commitment that can be hard to manage on your own. Do you want help? Speak to your doctor or diabetes nurse.

High Blood Pressure – Hypertension

High blood pressure – hypertension – is today considered as a common disease. Your blood pressure is either measured sitting down or lying down after a few minutes of rest. Both the high pressure and the low pressure are measured in the unit mmHg, millimetre of mercury. The high pressure, or systolic pressure, is the pressure that occurs in the largest artery (the aorta) when the heart is pumping oxygenated blood into the body. The low pressure, or diastolic pressure, is the pressure that is in the blood vessels between heartbeats. High blood pressure means a systolic pressure of >140 mmHg and a diastolic pressure of >90 mmHg, regardless of age.

Increased blood pressure has a long-term effect on your heart and your vascular system, which significantly increases the risk of other complications such as heart attack, stroke and heart failure. In people with diabetes or kidney disease, the limit for high blood pressure is below 130/80 mmHg in order to reduce the risk of complications.

Other risk factors when you have high blood pressure, apart from diabetes, are obesity, alcohol, snuff/smoking, lack of exercise, stress and age.



If you have increased blood pressure, you should consider that lifestyle changes, such as weight reduction, exercise, healthy eating habits, stopping using snuff or smoking and lowering your alcohol intake, can influence your total risk.

Drug treatment may help you in reaching a lower target level for your blood pressure. It is therefore extremely important that you take the medicines that your doctor has prescribed for you.

Treatment

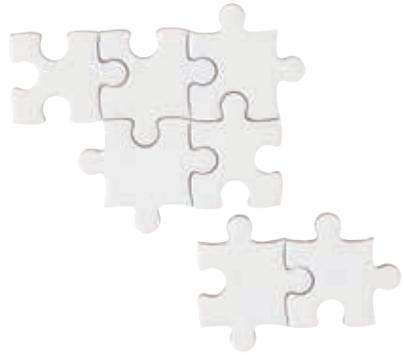
The main goal with all diabetes treatment is to achieve the most normal blood sugar level possible. How you achieve this depends entirely on the type of diabetes that you have. The blood sugar level is affected by what you eat, how you are feeling, how much you exercise and the diabetes medications that you are taking.

Food is the cornerstone of all diabetes treatment. A diabetes diet is not an extreme diet, but regular, healthy food. If you have diabetes you should choose the same food as people who want to eat a healthy diet. This means a lot of vegetables, foods high in fibre and avoiding too much fat and sugar.

Treatment for Type 1 Diabetes

Since type 1 diabetes is caused by the majority of insulin-producing cells in the pancreas being destroyed, insulin treatment is necessary. This is tailored to your needs and is planned together with a diabetes team.

The most common treatment regimen consists of a basal insulin that covers the basic requirement, combined with a direct-acting insulin that you take with food to counteract the elevation in the blood sugar that occurs.



You can also get treatment with an insulin pump. These pumps deliver a regular amount of insulin during the day and night and you can also take extra insulin doses with your meals.

Patients who have recently become ill with type 1 diabetes and have started insulin treatment often need very small amounts of insulin. The reason for this is that the remaining insulin-producing cells have recovered somewhat and are able to produce a little more insulin. This period is sometimes called “the honeymoon period” and the need for insulin will slowly increase again.

Treatment for Type 2 Diabetes

Nutrition is probably the most important treatment for those with type 2 diabetes. For overweight people, weight loss is extremely important. Good, healthy food in moderate amounts is a prerequisite for this, preferably in combination with increased exercise. Weight loss lowers insulin resistance, blood sugar and high levels of harmful types of fat in the blood.



Exercise is especially important for those with type 2 diabetes. Muscle work increases the effect of the insulin that your own body produces. This in turn lowers the blood sugar levels.

Simple, everyday exercise, such as walking or cycling instead of taking your car, using the stairs and not the elevator or getting off the bus one stop earlier and walking the last bit, is very beneficial. A good benchmark can be two and a half hours of physical activity per week, e.g. a fast walk for 30 minutes, five times a week.

Lifestyle changes, diet, exercise and weight loss can have an excellent effect, albeit transient.

Treatment with Tablets

For many who live with type 2 diabetes, lifestyle changes are not sufficient. It is then necessary to complement with diabetes medication.

There are several types of tablet treatment for type 2 diabetes; however, the most common ones can be divided into two groups.

There are tablets that stimulate the release of insulin from the insulin-producing cells in the pancreas and then there are tablets that lower insulin resistance.

It is not unusual to take both kinds of tablets simultaneously and there are also tablets with ready-made combinations of some of the ones mentioned above. Just over 50% of everyone with diabetes type 2 are treated with tablets.

Insulin Addition

The next step in type 2 diabetes is to add one or more injections of insulin on a daily basis.

Treatment with insulin is the most effective way to lower the blood sugar (except for diet, exercise and weight loss) but sometimes it takes too long before insulin treatment is started. Many keep struggling with diet, exercise and tablets and do not realise that the treatment is insufficient. Sometimes this delay in adding insulin is due to hesitation from the healthcare provider.

It is therefore important for everyone involved, i.e. the doctor, diabetes nurse and patient, to have an active attitude, in which high blood sugar levels

are not acceptable. About 35 percent of people with type 2 diabetes are treated with insulin today.

Combination Treatment

Many with type 2 diabetes combine tablet and insulin treatment. Sometimes it is enough with tablets plus basal insulin but others may need to take mealtime insulin with their meals, just like a patient with type 1 diabetes. Over time it is common that tablets can be stopped and to only use insulin, since some tablets no longer have an effect.



Insulin

Since their discovery just over 80 years ago, insulins have improved and their number has increased. They have become more tailored to fit different kinds of diabetes and to better mimic a normal insulin production. The choice of insulin depends on what type of diabetes and what individual needs you have.

Basal Insulin

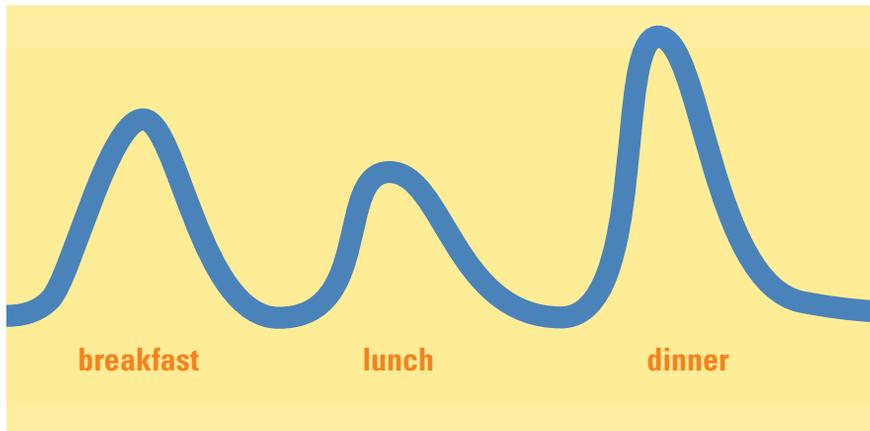
Everyone with type 1 diabetes, but also many with type 2 diabetes, takes two kinds of insulin. One that works *over a longer period of time* and one that works *rapidly*.

Insulin that works over a longer period of time is called *basal insulin*. This type of insulin should have a low and even blood sugar-lowering effect over a longer period of time, preferably over 24 hours.

A person who does not have diabetes always has a small amount of insulin in the blood, which keeps the glucose metabolism balanced. Without this base level of insulin, the body starts producing its own sugar, which mainly happens during the night. Types of insulin that are moderately long-acting must normally be injected twice every 24 hours; the long-acting insulins usually only once every 24 hours.

For some years now there have been long-acting basal insulins with a long and even 24-hour effect. For many people it is enough with only one injection every 24 hours, at an optional time in the day (but always at the same time every day).





Mealtime insulin

In type 1 diabetes, often also in type 2 diabetes, you have to complement the basal insulin with an insulin that has a shorter effect. This is called mealtime insulin. These insulins should be taken with meals, normally three times per day at breakfast, lunch and dinner, but sometimes also if you have an afternoon or evening snack.

The mealtime insulin manages the blood sugar elevation that happens after you have eaten. The effect is rapid and does not last for more than a few hours. The dose is preferably adjusted

according to the blood sugar level, how much you will be eating and also if you have exercised or if you are planning to be physically active.

Mixed Insulin

There is also a type of insulin that is a mix of basal insulin and a small amount of mealtime insulin. This type of insulin combines, in one single injection, the long-term effect of the basal insulin with the short-term effect of the mealtime insulin. With this type of insulin there is, however, a risk that the flexibility of the treatment is reduced.

High and Low Blood Sugar

LOW BLOOD SUGAR

If you take too much insulin or too many tablets in relation to the amount you eat or exercise, your blood sugar may drop too low. Then you will have what is sometimes called a *hypo* or *hypoglycaemia*. This is often an uncomfortable experience and can, if untreated, be serious.

Therefore it is very important that you learn to recognise the signs of too low blood sugar in order to prevent it well ahead of time. Try to quickly eat some dextrose (which should be kept easily available) or some other type of carbohydrate, for example milk and a sandwich).

Common and early signs of low blood sugar are *hunger, shaking, sweating and turning pale*.

If the blood sugar keeps dropping, further symptoms may occur, such as *confusion, drowsiness, changes in behaviour, double vision, unconsciousness and seizures*.

Hypoglycaemic events can be very dangerous. Therefore, it is very important that you know what to do if you have a hypo. If you do not eat some form of sugar, you will have to seek urgent medical care.

A Difficult Balance

The closer a person with diabetes is to an ideal blood sugar control, the higher the risk is for blood sugar drops and hypos. After a hypo it is common that the blood sugar rises to high levels. This is caused by the sugary foods that you eat to reverse the hypo and because of stress hormones that are released into the blood elevating the blood sugar. If you have hypos often, the blood sugar can therefore vary a lot.



HIGH BLOOD SUGAR

High blood sugar (*hyperglycaemia*) can cause problems if you do not do anything about it. In the long term, chronic changes can occur in different parts of the body. Even in the short term, the blood sugar can cause problems if the elevation is severe for a longer period of time. It is therefore important that you are aware of what you can and should do to keep the blood sugar at a good level.

There are many explanations as to why the blood sugar becomes too high. For example, insufficient treatment with insulin or tablets, too much food, less physical activity than planned, acute illness, stress at work, etc.

Symptoms of high blood sugar can be *increased thirst, increased amounts of urine, tiredness, headaches, and blurred vision*. It is important that you take action against a severe elevation in blood sugar ahead of time.

Diabetic Coma

If you have type 1 diabetes and your blood sugar increases severely, the condition can quickly (sometimes within 24 hours) lead to acid poisoning, or so-called diabetic coma. This condition can only develop during severe insulin deficiency.

The symptoms of a diabetic coma are *breathlessness, acetone or fruity smell, nausea*

and vomiting, thirst and a dry mouth. This is a very serious condition that always has to be treated in hospital, often in an intensive care unit.

If you have type 2 diabetes, high blood sugar rarely causes this type of reaction. However, if you have very high blood sugar for a longer period of time, a condition with dehydration, sodium imbalance, nausea and an effect on your general condition develops. If you feel uncertain of what to do, you should always contact a healthcare provider for advice and help.

What Happens in the Long Term?

Increased blood sugar or diabetes can slowly damage some of the blood vessels in the body. This involves a higher risk of diseases such as heart attack and stroke because of the damage to major blood vessels. Also the smaller blood vessels in the eyes, the kidneys and the nerves may become damaged by prolonged high blood sugar levels.

With today's methods to treat diabetes, you have a chance to achieve good diabetes control and therefore reduce the risk of these complications. The modern types of insulin and the possibility for self-management, in combination with updated treatment programs, mean that if you live with diabetes you may live a life that is not very different from a life without diabetes.

Self care

Blood Sugar Control

If you live with diabetes you will feel your best, both short and long term, if your blood sugar is low, but not so low that hypos occur.

To be able to control and evaluate your treatment, you will check your blood sugar yourself. This is done with a small needle prick in your finger and with the help of a glucose meter in your home that will give you a blood sugar reading in 15–30 seconds.

The glucose level in the blood (what we usually call blood sugar level) is normally 3.5–4.5 mmol per litre of blood when you wake up and about 6–7 mmol later in the day. It is of course good to have a blood sugar level that is as close to these normal values as possible. You must always weigh this against the risk of hypos. The values that are right for you are decided by you and your doctor/diabetes nurse.

Many patients check their blood sugar several times a day, often in the morning and before meals. But even if you check your levels often, it does not give a complete picture of how the treatment works. Therefore you must also check your long-term levels, at least a few times per year.

Long-term HbA1c

HbA1c or “long-term glucose level” – tells you about your blood sugar in the past two to three months before the sample was taken. The blood sample is taken from the tip of your finger or from your arm. The sample measures how much sugar (glucose) that has been sticking to the haemoglobin in the red blood cells. In high blood sugar, more sugar sticks to them than normal. The higher the blood sugar level, the higher the HbA1c level.



From September 2010, a new way of presenting the result from an HbA1c test was initiated. With the new measuring method, a result of 52 mmol/mol is the same as 6.0% with the old method.

For a person with diabetes, the general target is for HbA1c to be under 52 mmol/mol. A good individual goal in diabetes depends on many factors. During a visit with a doctor or diabetes nurse, individual treatment goals are discussed and determined together with the person with diabetes and the doctor who is responsible for the treatment. An HbA1c value of 52 mmol/mol means that the blood sugar is on average 9 mmol/l, i.e. mildly to moderately increased.

Adjust the Insulin Dose – Reach your Target

Regardless of what type of diabetes treatment you have, it is important to set goals for your treatment. It is extremely important that the treatment is consistent and adjusted to reach the target that has been set. Once you have reached a goal, it can often be possible to reach new, harder-to-reach goals. Not enough people with diabetes are feeling as well as they should. In the long-term, they also suffer an increased risk of diabetic complications. If you are treated with insulin and given an individual

dosing schedule, you may adjust your insulin doses on your own in a safe way. You can then quickly reach the goals for the treatment that you have set together with your doctor and diabetes nurse.



Tips and Advice

Alcohol

From a medical point of view, there is no reason to refrain from alcohol in moderate amounts. It is, however, important to know that alcohol has a blood sugar-lowering effect. This may mean that you might have to eat a little extra or reduce your diabetes treatment before you go to bed after you have been drinking alcohol. It is also important to remember that the blood sugar-reducing effect of alcohol can last for up to 24 hours after the intake of alcohol.

Smoking

Tobacco aggravates many of the problems and risks that patients with diabetes have due to their disease. This mainly concerns cardiovascular diseases. But smoking also increases the risk of infections, eye disorders, impotency, foot ulcers, nerve damage and kidney problems. It also becomes harder to control the blood sugar, since nicotine contributes to insulin resistance and therefore makes it difficult for the body to break down the sugar.

So, if you are a smoker and have diabetes, there are many reasons to quit!

Exercise and Sports

Normally, blood sugar drops following physical activity, but this can vary from person to person and also with the level of exertion. Some people even experience that blood sugar goes up when they exercise. Different types of exercise also affect blood sugar differently. Aerobic, heart rate-raising exercise such as gymnastics, running, and swimming lowers blood sugar more than lifting weights and walking.

It is therefore important to check your blood sugar both before and after exercise and figure out how your own body reacts to different types of exertion. If you are uncertain, you should always talk to your doctor or diabetes nurse.



Travelling

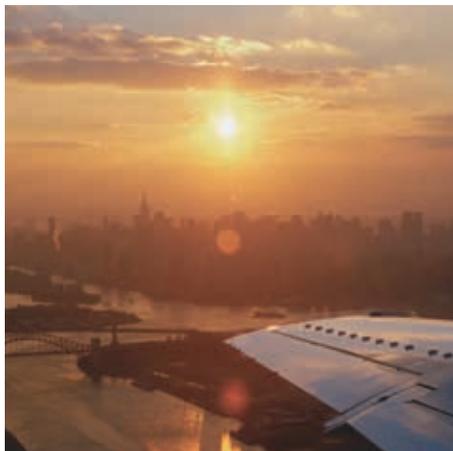
If you have diabetes, planning ahead is extra important if you are travelling. On longer trips, mainly trips abroad, you should carry some form of certificate or information from your doctor. This certificate informs that you have diabetes and, if you are treated with insulin, that you have to bring insulin, injection accessories and needles. It is also important that you check that you have enough medication, test material and prescriptions to last the entire trip. It is good to carry this in your hand luggage, to avoid the risk of it getting lost.

If you are planning to travel to a different time zone, you must talk to your doctor or diabetes nurse about how to adjust your insulin doses. If you are travelling east, the day gets shorter and this may mean that you need less insulin. When travelling west, the day instead gets longer and you may need more insulin.

Blood sugar checks are even more important when you are travelling. Tiredness and jet lag can make it harder to notice if your blood sugar is high or low.

Illness

Illnesses, such as colds, other infections and injuries, may cause a stress situation in the body. The body then responds with excreting stress hormones



such as adrenaline and cortisone. These hormones have an important job in raising blood sugar as a response to the stress reaction to protect the individual. Therefore it is often much harder to keep the blood sugar level well controlled when you are ill, and you risk getting high blood sugar levels (hyperglycaemia). For this reason it is important that you continue with your diabetes treatment and check your blood sugar frequently, even when you are ill and not eating as well or vomiting. If you feel uncertain in any way, contact your doctor or diabetes nurse.

Make Demands on Healthcare Providers

As a patient you should make demands. Effective treatments are available.

If a medication is not working well, there is often a better alternative. It is unfortunate to have high blood sugar levels for several months.



Remind your doctor or diabetes nurse to adjust your treatment towards the set blood sugar and HbA1c target that you have agreed on.

Everyone in the risk zone of getting diabetes should have his or her blood sugar checked regularly. "A dash of sugar" as they used to say. Today we know that this negligent attitude is old fashioned. Moderately elevated blood sugar levels cannot be felt but are detrimental in the long term.

Take Control over your Disease

You have everything to gain from good blood sugar control. You should strive for the best possible and suitable medical treatment in order to reach blood sugar and HbA1c levels as close to normal as possible, from your unique standpoint. You must also take responsibility for the requirements that the disease has on your lifestyle.

Assuming that you are prepared to learn to live with your diabetes, efficient treatment is available today.

The facts in this book have been reviewed by
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For more information about diabetes and diabetes
treatment, go to **www.insulin.se**



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