

Patient information from the BMJ Group

Diabetes, type 1

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Diabetes, type 1

Diabetes is a long-term condition that can lead to serious health problems. But taking insulin, eating a healthy diet, and exercising regularly can help you live a long and healthy life.

We've brought together the best research about type 1 diabetes and weighed up the evidence about how to treat it. You can use our information to talk to your doctor and decide which treatments are best for you.

This information is for people with type 1 diabetes, which starts in childhood. For more information about type 2 diabetes, which usually starts later in life, see [Type 2 diabetes](#).

What is type 1 diabetes?

If you have type 1 diabetes, you have too much glucose in your blood. Glucose is a kind of sugar that your body uses for energy. But if it builds up in your blood, it can make you ill.

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Diabetes is a long-term condition, but with the right treatment you can live a long and active life.

Diabetes doesn't go away. And if you don't treat it, you can get serious health problems.

If you take insulin as advised, eat well and exercise, and keep a close watch on your condition, you can keep your blood glucose under control. You should be able to live a long and healthy life.

Key points for people with type 1 diabetes

- Diabetes is a serious condition. But with the right treatment you should be able to stay healthy.
- If you have diabetes you have too much glucose in your blood.
- There are two main types of diabetes: type 1 and type 2. This information is for people with type 1 diabetes. See also [Type 2 diabetes](#) .
- If you have type 1 diabetes, you need to control the glucose in your body with injections of a hormone called insulin. You'll also need to eat a healthy diet.
- Over time, having too much glucose in your blood can damage your blood vessels. This can lead to problems in your heart, eyes, kidneys , and other parts of your body.
- If you keep your blood glucose level as close to normal as possible you may be able to avoid these health problems.

What's a normal glucose level?

You always need to have some glucose in your blood. Glucose comes from food, and it gives your body energy. Every cell in your body needs glucose to work properly.

Normally, the amount of glucose in your blood is carefully controlled by a chemical called insulin. Insulin is a hormone made by your pancreas, a gland that sits behind your stomach. Insulin helps move the glucose from your blood into your body's cells. Your cells then use the glucose as energy. Insulin keeps the level of glucose in your blood steady.

Doctors measure glucose levels in millimoles per litre (mmol/L) of blood. The amount of glucose in your blood should be between 4 mmol/L and 10 mmol/L. ^[1]

Your doctor may talk about your blood glucose level using just the number. For example, he or she might say, "Your blood glucose is 10." Normally, your blood glucose level goes up and down through the day. Before you eat breakfast, for example, it should be between 4 mmol/L and 7 mmol/L. An hour or two after you eat, it may rise to 10 mmol/L.

To learn more, see [What is glucose?](#) and [How does my body control my blood glucose level?](#)

Type 1 diabetes

Type 1 diabetes usually starts in childhood or the teenage years, but it can also start when you're an adult. Between 5 in 100 and 10 in 100 people with diabetes have type 1. ^[2]

If you have type 1 diabetes, your body has stopped making insulin. This kind of diabetes used to be called **insulin-dependent diabetes mellitus** (or IDDM for short) because it needs to be controlled by taking insulin injections. You may also hear people call it **juvenile-onset diabetes**. It used to be called this because it tends to start when people are young.

What happens in type 1 diabetes?

If you have diabetes, your body can't control how much glucose is in your blood. Instead of the glucose being gradually used up as fuel by your cells, it builds up in your bloodstream. You'll hear the word **hyperglycaemia** a lot. It means having too much glucose in your blood. See [What are the symptoms of type 1 diabetes?](#) to find out how this affects you.

You need insulin to keep your blood glucose level under control. But when you have type 1 diabetes, your body stops making insulin, or makes very little of it.

If you have diabetes that is not treated, your blood glucose level is likely to be more than 7 mmol/L first thing in the morning before breakfast. But it can be much higher, rising to as much as 30 mmol/L or more. Your glucose level can become this high because your body doesn't make enough insulin.

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What causes it?

Usually, type 1 diabetes is an **autoimmune disease**. This means that the cells in your immune system, which normally fight germs, attack some of your own cells by mistake. In type 1 diabetes, your immune system attacks the cells making insulin in your pancreas.

Diabetes: why me?

We don't know why the immune system starts killing the cells in the pancreas. The attack may be triggered by viruses, but no one knows for certain. Some of the things researchers think have a role are:

- The virus that causes German measles (also called rubella)
- The virus that causes hand-foot-and-mouth disease
- Your genes. If your genes give you a low chance of getting diabetes, you might not be affected by these other things. ^[3]

You probably won't notice when the cells that make insulin start dying. You only need a small number of these cells to keep your blood glucose level under control. But once you lose about four-fifths (or 80 percent) of these cells, you start to get symptoms of diabetes. This happens because glucose begins to build up in your blood. ^[4]

Types of diabetes

There are two main types of diabetes: type 1 and type 2.

- Type 1 diabetes usually starts in childhood or adolescence.
- Type 2 comes on gradually, usually after the age of 40.
- There's also a condition called **impaired glucose tolerance**. This isn't diabetes, but it does increase your chances of getting diabetes.
- Some women get a kind of diabetes that only happens while they're pregnant. This is called **gestational diabetes**.

This information is for people with type 1 diabetes. For more information about other types of diabetes, see:

- [Type 2 diabetes](#)
- [Other types of diabetes and high blood glucose](#)

What are the symptoms of type 1 diabetes?

If you have diabetes, you have too much glucose (sugar) in your blood. When the level of glucose in your blood goes too high, doctors call this hyperglycaemia. It causes most of the symptoms of diabetes.

There are two main types of diabetes. If you have type 1 diabetes, you will probably get symptoms quite suddenly, over a few days or weeks. In type 2 diabetes, your symptoms can appear over several years, but many people don't have any symptoms. This information is for people with type 1 diabetes. We also have information on [type 2 diabetes](#) .

Some of the common symptoms of diabetes are described below. ^[4]

Needing to urinate more often

Your body tries to get rid of the extra glucose in your blood by flushing it out in your urine. You may need to go to the toilet more often, especially at night. This is an early symptom of diabetes.

Feeling very thirsty

You may feel thirsty more and more often. You may even wake up during the night feeling thirsty. One reason for this is because you urinate more. Losing all that fluid leaves you dried out. Feeling thirsty is also one of the first symptoms of diabetes.

Feeling very hungry or tired

Glucose can't get into your cells, so your cells don't get the fuel they need to work properly. Your brain senses that you need more fuel, and it makes you feel hungry so that you'll eat more. At the same time, you get tired because your cells aren't getting the glucose they need. The energy supply is there, but you can't use it.

Losing weight without trying

Because your cells can't use the glucose in your blood, they start to burn up fat instead. Your body fat starts to go down, and you will notice that you've lost some weight.

If you have type 1 diabetes and your blood glucose gets very high, you may get a condition called **ketoacidosis**. This is a medical emergency. For more information, see [Hyperglycaemia](#) .

How do doctors diagnose diabetes?

If you have diabetes, it's important to get it diagnosed. So if you or your child has been feeling very hungry or thirsty and losing weight for no reason, see your GP.

Don't ignore the symptoms of diabetes. It's important to diagnose diabetes quickly so that you can start treatment and stay as healthy as possible. Mostly, symptoms of type 1 diabetes start in childhood. For more, see [What are the symptoms of type 1 of diabetes?](#)

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Your GP will ask you about any symptoms you have, and he or she will do a test to see how much glucose (sugar) is in your blood, as well as other blood and urine tests. These will usually tell your doctor whether you have type 1 diabetes. You may need more than one glucose test, to be sure that you have diabetes. ^[29]

Fasting plasma glucose test

Many GPs have small machines called blood glucose meters in their surgery. They can take a drop of your blood by pricking your finger, do the test and give you the result straight away. But these machines aren't as reliable as those in laboratories. You need to have a laboratory test before your doctor can say for sure that you have diabetes.

You should have a test that measures how much glucose is in your blood first thing in the morning, before you have eaten. ^[30] When you don't eat, it is called fasting. So doctors call this test a fasting plasma glucose test. The result is your **fasting plasma glucose level**. If it is more than 7 mmol/L, you have diabetes (mmol/L stands for millimoles per litre).

Testing your blood after you've eaten isn't as reliable as testing it when you've been fasting. But you've probably got diabetes if your glucose level is more than 11.1 mmol/L at any time during the day. ^[30]

For most people, the diagnosis of diabetes is quite easy. But you may need a second test if your glucose level is on the edge of the normal range. That test is called an **oral glucose tolerance test**.

Oral glucose tolerance test

This is the most reliable test for diagnosing diabetes, although it is rarely needed. It shows how your body copes with a lot of glucose. You may have to go to a hospital clinic to have this test.

You take this test first thing in the morning, before you eat. First, your doctor measures how much glucose is in your blood (your fasting plasma glucose level). Then you drink a very sugary liquid. Two hours later, the level of glucose in your blood is measured again. This is called your **two-hour plasma glucose level**. If this level is more than 11.1 mmol/L, you have diabetes.

Other tests

If you've just been told you have diabetes, your GP or hospital specialist will probably want to do other tests on your blood and urine. These might include tests to check on your **thyroid gland**, **liver**, **kidneys**, and **cholesterol**.

After you've been diagnosed with diabetes, you should have a thorough check-up once a year with a doctor experienced in treating diabetes. ^[30] To learn more, see [Yearly check-up](#).

How common is diabetes?

We don't know exactly how many people in the UK have type 1 diabetes. But it is much less common than [type 2 diabetes](#) .

This is what we know from research about diabetes.

- More than 3 million people in the UK have one of the types of diabetes. That's about 3 percent of everyone in the UK. ^[13]
- Type 1 diabetes is less common. About 10 in 100 people with diabetes have type 1. ^[14]
- About 4 children in 100,000 are diagnosed as having type 1 diabetes in the UK each year. ^[15]
- Type 1 diabetes is getting more common. The numbers all over the world are increasing each year, and children are being diagnosed younger. But we don't know why this is. ^[16] ^[17]

What treatments work for type 1 diabetes?

There isn't a cure for type 1 diabetes. But treatments can help you lead a long and healthy life by keeping the amount of glucose (sugar) in your blood close to normal. If your glucose gets too high or too low, you can become ill.

Keeping your blood glucose level close to normal can also prevent some of the extra problems linked with diabetes. Doctors call these complications (to learn more, see [What will happen to me?](#)). And if you already have complications, controlling your blood glucose better might stop some of them getting worse.

If you have type 1 diabetes, your body doesn't make enough insulin. You will need to have insulin injections to control your blood glucose (sugar). Leading a healthy lifestyle and keeping a close check on your blood glucose levels will help you stay well.

Key points about treating type 1 diabetes

- You will need to take insulin to control your blood glucose (sugar). You might need to have insulin injections three or more times a day. And you might have to check your blood glucose levels several times a day and adjust your insulin.
- The best way to avoid complications is to keep your blood glucose levels very close to normal. This is sometimes called tight control or intensive treatment. You may be able to do this in an intensive treatment programme.
- To keep your glucose levels close to normal, you need to watch what you eat and exercise regularly, as well as use insulin.

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- Tight control can have a serious side effect. Your blood glucose might get too low. Doctors call this [hypoglycaemia](#) .
- You will need to have regular blood tests to see if your treatment is working. Every few months, your doctor will check your [haemoglobin A1c level](#) . This is like your average blood glucose level.
- You will also need regular check-ups of your eyes, your feet, and your skin. You may need some treatment to prevent your eyes getting damaged.
- Extra education to help you manage your diabetes may help you keep your blood glucose under control, and help you enjoy life more.

There are several treatments for type 1 diabetes. But which treatments work best? We've looked at the best research and given a rating for each treatment according to how well it works.

For help in deciding if a treatment is right for you, see [How to make the best decisions about treatment](#).

Treatment Group 1

Treatments for type 1 diabetes

Usual treatment

- [Insulin therapy](#) : You take insulin every day to control your blood glucose (sugar). [More...](#)

Treatments that are likely to work

- [Education](#) : You learn new ways of managing your diabetes. [More...](#)
- [Insulin pump](#) : This is a machine that gives you a steady flow of insulin under your skin. [More...](#)
- [Intensive treatment programmes](#) : Your diabetes doctors and nurses help you to keep tight control over your blood glucose levels. [More...](#)

Treatments that need further study

- [Talking treatments](#) : These involve talking with a therapist or counsellor to help you cope better with your disease and manage your blood glucose levels. [More...](#)

What will happen to me?

In the short term

Being told you have type 1 diabetes can come as a shock, but it's perfectly possible to be healthy and active with this condition. There are even top athletes with diabetes. Jay Cutler, an American football player, continued his career after being diagnosed with type 1 diabetes. Sir Steve Redgrave won one of his Olympic gold medals in rowing after starting insulin treatment for type 2 diabetes.

Nevertheless, if you have type 1 diabetes, you should expect some changes in your life. You'll have to:

- Take insulin regularly
- Watch what you eat
- Exercise regularly
- Check your blood glucose (sugar) level throughout the day.

Apart from these changes, you should be able to take part in all your normal activities.

If you take insulin, you must inform the Driver and Vehicle Licensing Agency (DVLA) about your diabetes. You must also tell the DVLA if you have a complication that could affect your driving, such as a problem with your eyes. If you don't, your driving licence and car insurance may no longer be valid. ^[11]

When you have type 1 diabetes, you have to keep a balance between having too much glucose in your blood, and not having enough.

- Too much glucose is caused by having diabetes. It's called **hyperglycaemia**.
- Too little glucose is usually a side effect of taking insulin to treat diabetes. It's called **hypoglycaemia**.

You'll need to recognise the signs of hyperglycaemia and hypoglycaemia, as well as checking your blood glucose regularly. Most people with diabetes can manage hyperglycaemia and hypoglycaemia and keep their blood glucose at about the right level. But if your blood glucose gets very high, or very low, it can be dangerous. For more information about having too much glucose, see [Hyperglycaemia](#) . For more information about having too little glucose, see [Hypoglycaemia](#) .

In the long term

When you've had diabetes for a long time, you're likely to get some extra health problems. Your eyes, **kidneys** , feet, and heart are the parts of your body most likely to be affected.

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Doctors call these problems complications. Not everyone with diabetes gets complications. Some people have diabetes for 40 or 50 years without getting complications. ^[3]

We know that if you carefully control your blood glucose level, you are more likely to stay healthy. The closer your blood glucose is to normal, the less likely you are to get complications. ^[18] ^[19] The best way to keep your blood glucose close to normal may be by having intensive treatment. To find out more, see [Intensive treatment programmes](#) .

The longer your blood glucose level stays above normal, the more damage it causes.

Doctors and scientists don't know for certain how complications happen. They know that large amounts of glucose in your blood can harm certain parts of your body. But your genes also play a part. ^[3] This means that your chance of getting complications depends partly on the genes passed to you from your parents. It may also depend on other things, such as your blood pressure or your cholesterol level.

Having high levels of glucose in your blood over many years can damage large blood vessels called arteries, making them more narrow inside. It can also damage some of your small blood vessels, making them leaky.

Complications can affect several different parts of the body. Changes to your large blood vessels can lead to complications in your heart. Changes to your small blood vessels can lead to complications in your eyes, kidneys , and nerves. These problems might leave you feeling depressed, as can the possibility that you may one day develop these problems. If you are feeling depressed, talk to your doctor. There are treatments that can help.

Click on the links below to find out more about complications. Do bear in mind that not everyone gets them.

- [Eye problems](#)
- [Kidney problems](#)
- [Nerve damage](#) (and problems with your feet)
- [Heart and blood problems](#)
- [Infections](#)
- [Psychological problems](#)

Curing or preventing diabetes

Scientists are looking at ways to cure type 1 diabetes. They are trying to take cells that make insulin from healthy people and put them into people with diabetes. This is called

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islet cell transplantation. It might work in the short term. But most people who have islet cell transplantation need insulin again after two years. ^[20]

It might also be possible to prevent type 1 diabetes. Researchers have found that some treatments have worked in animals. This is encouraging, but they might not work in people. ^[4]

And in the future, people at risk for diabetes might be able to be vaccinated with insulin to stop them getting the disease. The idea is that the vaccine could stop your **immune system** attacking your **pancreas**. ^[4]

Questions to ask your doctor

If you've been told you have diabetes, you may want to talk to your GP, hospital specialist or diabetes nurse to find out more.

Here are some questions that you might want to ask:

- Why do I have diabetes?
- What type of diabetes do I have?
- What kind of diet and exercise should I follow?
- What is the best way for me to take insulin?
- Could the food I eat be making my diabetes worse?
- Do I have to stop eating sweet foods?
- Should I be checking my blood glucose level myself? How often do I have to check my blood glucose?
- Will I get bouts of low blood glucose? If so, how can I recognise them and how should I treat them?
- Can I keep on driving?
- Is there anything I can't do?
- Should I exercise more?
- Is there anything special I should do before I exercise? (Take less insulin? Eat something, such as a banana?)
- Am I at risk of getting any other diseases?

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- What can I do to avoid getting extra problems (complications)?
 - Are members of my family likely to get this type of diabetes too? If so, is there anything I can do to protect them?
 - What should I do before planning to become pregnant?
-

Treatments:

Insulin therapy

In this section

[Can it be harmful?](#)

This information is for people who have type 1 diabetes. It tells you about insulin therapy, a treatment used for type 1 diabetes. It is based on the best and most up-to-date research.

Insulin is a **hormone** that your body uses to keep the amount of glucose (sugar) in your blood at a steady level. Insulin is made by your **pancreas**, a **gland** that sits just behind your stomach.

If you have type 1 diabetes, your pancreas doesn't make any insulin. You'll probably need to take insulin to keep your blood glucose level as normal as possible. And you'll need to start taking insulin as soon as you get diagnosed.

Taking insulin to keep your blood sugar as close to normal as possible can help you keep well and avoid [complications](#).

The only way of taking insulin is by injection. You can't take insulin as a tablet because the digestive juices in your stomach would destroy the insulin.^[4] There are special devices made for people with diabetes who need to take insulin (see below). These devices make injecting the insulin much easier.

For a little while, you could get insulin inhalers. But they didn't catch on, and they're not available any more.

The insulin used to treat diabetes is almost the same as the insulin made by your pancreas. Some kinds of insulin treatments come from pigs and cows. But these kinds aren't used much any more. Nowadays, most people who need insulin are treated with a human type of insulin. Human insulin is made in a laboratory using genetic engineering technology. **Bacteria** or **yeast** are used to produce insulin that is the same as the insulin made by humans.

If your religion means you don't want insulin treatments from pigs or cows, let your doctor know. You should be able to use other types.

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Types of insulin

Different types of insulin are used to treat diabetes. Each type works at a different speed. Some are a mixture of two types.

The types of insulin and their important features are shown in the table below. ^[12]

Fast acting

Name	Brand names	Starts working in	Largest effect in	Stops working in
Insulin lispro	Humalog	5 to 15 minutes	45 to 90 minutes	3 to 4 hours
Insulin glulisine	Apidra	5 to 15 minutes	45 to 90 minutes	3 to 4 hours
Insulin aspart	NovoRapid	10 to 20 minutes	1 to 3 hours	3 to 5 hours
Soluble insulin	Actrapid, Hypurin, Humulin S, Insuman Rapid	30 minutes	2 to 5 hours	5 to 8 hours

Medium and long acting

- Start working in 1 to 4 hours
- Largest effect in 4 to 12 hours
- Stop working in 16 to 35 hours

Name	Brand names
Insulin detemir	Levemir
Insulin glargine	Lantus
Insulin zinc suspension	Hypurin Bovine, Monotard, Ultratard
Isophane insulin	Hypurin Bovine Isophane, Hypurin Porcine Isophane, Insulatard, Humulin I, Insuman Basal
Protamine zinc insulin	Hypurin Bovine Protamine Zinc

Premixed combinations (fast- and long-acting insulins together)

- Start working in 30 minutes
- Largest effect in 2 to 3 hours, and 8 to 12 hours
- Stop working in 16 to 24 hours

Name	Brand names
Soluble and isophane insulin mixture	Hypurin Porcine 30/70 Mix, Mixtard 10/20/30/40/50, Humulin M3, Insuman Comb 15/25/50
Biphasic insulin aspart	NovoMix30
Biphasic insulin lispro	Humalog Mix 25/Mix 50

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Some research has shown that insulin lispro may be preferable over a lifetime, compared to regular human insulin. You may be less likely to have episodes of severe low blood glucose (hypoglycaemia) if you take insulin lispro rather than regular human insulin. ^[32] However, the important thing is to find a type that suits you personally.

Your dosing schedule

The type of insulin your doctor recommends will depend on how your body responds to the insulin and how you want to use it. For example, you might inject fast-acting insulin three times a day at mealtimes and use medium-acting insulin at bedtime. Or you might use a pre-mixed combination of insulins, which you inject twice a day.

Your doctor or diabetes nurse will help you work out a dosing schedule that suits you. You may need to be patient, as different people need different dosing schedules. For example, if you're a teenager, you may need a different schedule from an adult.

Some people find that they can manage their blood glucose best by having an insulin injection just before they eat, and then by having an injection of long-acting insulin at night.

Whether you're using fast-acting insulin, medium-acting insulin, or long-acting insulin, you will probably inject it 30 minutes before you eat a meal. But if you use some types of fast-acting insulin (for example, Humalog or NovoRapid), you should give yourself the injection just before you eat. Medium-acting or long-acting insulin can also be used before bedtime. These schedules can take some getting used to. But you will learn how to match your insulin doses with mealtimes and exercise times.

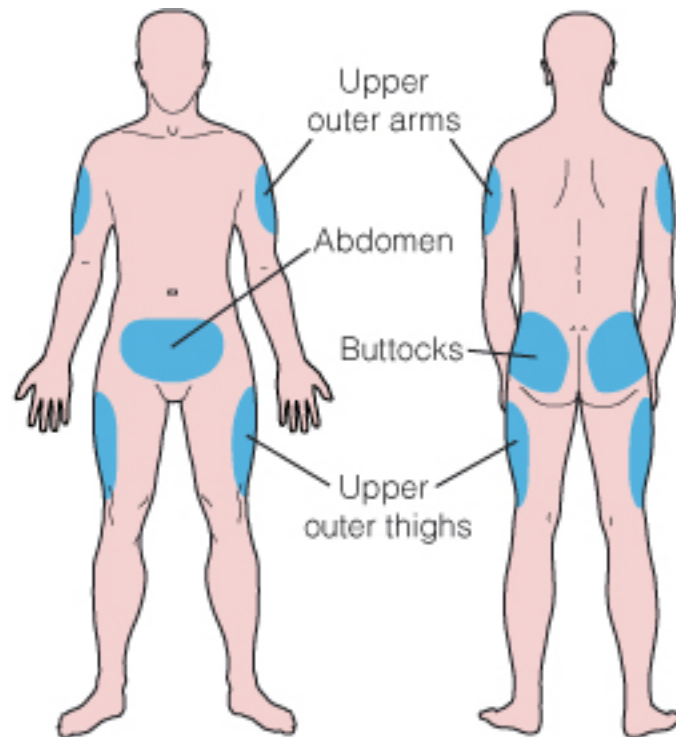
You will have to adjust your dose of insulin if you plan to eat more or less than usual. It's the same for exercise. You'll have to change your dose of insulin if you plan to exercise more or less than usual.

How much insulin you need also changes if:

- You have an **infection** (for example, if you have a sore throat)
- You're stressed
- You've had an accident
- Your body is having **hormone** changes from **puberty** or pregnancy.

You will need to be extra careful during these times. You may need to see your doctor or diabetes nurse if you find it hard to control your blood glucose levels.

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You can inject insulin into several parts of your body. Your doctor or nurse will show you how.

Where do I inject it?

You can inject insulin into several different places on your body, but there are a few rules to remember: ^[33]

- Insulin injected in your abdomen works fastest.
- Insulin injected into your thigh works more slowly.
- Insulin injected into your arm works at medium speed.

Some doctors suggest injecting insulin into your abdomen all the time, to be sure the same amount gets into your bloodstream each time. But not everyone can do this. Discuss with your doctor what's best for you.

Giving yourself an injection might seem strange at first. But your doctor or diabetes nurse will show you how to do it.

Insulin devices

Many people who need insulin inject it using a needle and syringe. Needles are now much easier to use than they used to be. Modern needles are very thin, so you hardly feel one when you inject yourself.

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But using needles and syringes can be hard, especially if you have **arthritis**. The good news is you can get several devices that make injecting easier.

Insulin pens

There are several kinds of insulin pen. They all work in the same way. They look like chunky pens.

- Some of the pens use an insulin cartridge. When it runs out of insulin, you get a new cartridge.
- Other pens are disposable. That means you throw them away when the insulin runs out.

With both kinds of pen, you set how much insulin you give yourself in each injection. Then you hold the pen against your skin and push a plunger or press a button to inject the insulin.

Insulin jet injectors

Jet injectors don't use a needle. So if you don't like needles, jet injectors might suit you. The injector uses air pressure to push a fine spray of insulin through your skin. The downside is that these devices are expensive, and some people find them painful. Also, you have to boil them often to sterilise them.

Insulin pump

An insulin pump looks a bit like a pager. It's about the same size and shape as a pack of cards. You can keep the pump in your pocket or you can hang it from your belt. You need to keep it with you all the time.

Inside the pump is a supply of insulin. This is pumped out through a long tube, attached to a needle that stays in your skin (a **cannula**). Most people put the needle into their stomach area, but your doctor can show you other places it can go.

The pump supplies a constant trickle of insulin into your bloodstream. You can change the programme on the pump according to what you're doing. So you could give yourself a dose just before you eat a meal.

You might not like the idea of having something attached to you all the time. But most people get used to it. And you can disconnect the tube for short periods. You might want to remove it while you're having a shower, going swimming, getting dressed, or having sex, for example.

A problem with insulin pumps is that the needle can get infected. But if you change the needle and tubing every two or three days, this is less likely to happen.

To read more, see [Insulin pump](#) .

Can it be harmful?

The biggest problem with taking insulin is getting a good balance between your insulin dose and your eating and activity.

- If you take too much insulin, you could get **hypoglycaemia**. This happens because your blood glucose drops too low.
- If you don't take enough insulin, your blood glucose goes too high. Then you get **hyperglycaemia**.

To find out more about low blood glucose, see [Hypoglycaemia](#) . To find out more about high blood glucose, see [Hyperglycaemia](#) .

If you have insulin therapy, you need to check your blood glucose level regularly. Try to avoid letting your blood glucose get too high or too low. To learn more, see [Checking your blood glucose](#) .

Diabetes education

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[How good is the research on diabetes education?](#)

This information is for people who have type 1 diabetes. It tells you about educational programmes for type 1 diabetes. It is based on the best and most up-to-date research.

Does it work?

Yes, probably. Learning new ways to manage your diabetes may help you enjoy life more, and help you control your diabetes better.

If you are a teenager, learning about type 1 diabetes with other teenagers is likely to help you have better control of your diabetes and make you feel better about your life.

What is it?

There are lots of different ways you can learn about diabetes. You probably had some education about diabetes when you were first diagnosed. But new training programmes have been developed in recent years, which show good results. There are education programmes aimed at children, at teenagers, and at adults.

The National Institute for Health and Care Excellence (NICE) says that everyone in the UK with type 1 diabetes should be offered an education programme. ^[34] If you are interested, ask your doctor.

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One programme for adults is called **Dose Adjustment For Normal Eating** (DAFNE). The five-day training course teaches you to match the dose of insulin you take with the amount of carbohydrate you eat at each meal. The idea is that you can choose what you feel like eating, and have the right amount of insulin to help your body process the glucose from the meal. ^[35]

There are lots of different types of programmes for teenagers to learn about handling their diabetes. Some take place at summer camps.

An educational programme for teenagers and young adults can include a variety of topics and activities. You might learn about: ^[36]

- [Checking your blood glucose \(sugar\)](#) and why it's important
- Injecting insulin correctly
- Solving problems
- Social skills
- Communication skills.

Educational programmes for children may also involve their parents or carers.

How can it help?

Having DAFNE education so you can match your insulin dose to your meal can: ^[35]

- Help you control your blood glucose better
- Give you the freedom to enjoy life more.

If you are a teenager with type 1 diabetes, an education programme can: ^[36]

- Help you feel better about living with diabetes
- Allow you to do more
- Help you have better control of your blood glucose.

But education programmes might not make a big difference to how well you control your blood sugar. For example, your [haemoglobin A1c level](#) might be about 0.5 to 1 percentage points lower (about 6 to 11 mmol/mol lower) with education than without it. This blood test shows how well your diabetes is being controlled. ^{[35] [37]}

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One study found that a shorter, two-and-a-half-day education course didn't improve people's blood sugar. However, it did help people feel happier with their treatment. ^[38]

A new type of education includes making use of new technology, which helps you record what you eat and adjust your insulin, using a computer programme. Research shows this seems easier and quicker to learn, and works as well as traditional calorie-counting. ^[39]

How does it work?

Having type 1 diabetes is stressful, especially for teenagers. It's hard to give yourself [insulin injections](#) and to check your blood glucose often. Getting education or having someone to talk to may help.

Doing the DAFNE training course gives you more flexibility to eat what you like, when you feel like it, without your blood glucose going too high or too low. If you can do this, you may be more likely to keep your diabetes under better control than if you hadn't had the DAFNE course.

If you're a teenager, your needs are different from adults. Your body changes during [puberty](#), and your diabetes control might get temporarily worse. Education may help you to cope with these changes. ^[36]

Education programmes for children can help both the children and their families learn to better manage their diabetes.

Can it be harmful?

Diabetes education isn't likely to be harmful. ^[36] People who were trained to adjust their insulin dose to their meals were no more likely to have very low blood sugar (hypoglycaemia) than people who didn't have training. ^[35]

How good is the research on diabetes education?

We found two studies looking at education for adults. ^[35] ^[40] We also found one big summary of the research (called a [systematic review](#)) on education for teenagers with type 1 diabetes. ^[36]

Evidence for education for adults

One good-quality study looked at what happened to 169 adults with poorly controlled type 1 diabetes. ^[35] Half of them went on the DAFNE training programme. People who had training had slightly better blood glucose control than people who didn't have training. People who had training enjoyed their life a little more.

One study looking at around 100 adults found that a shorter education course, lasting two-and-a-half days, didn't improve people's blood sugar. However, it did help people feel more empowered and happier with their treatment. ^[38]

Diabetes, type 1

Another study found that an education course about self-monitoring blood glucose made no difference to adults. But it was quite a small study, with only 37 people, and it may not have been reliable. ^[40]

Evidence for education for teenagers

We found one big summary of the research on education for teenagers with type 1 diabetes. ^[36] It included many studies in which some teenagers with type 1 diabetes got education and others didn't.

The teenagers who got diabetes education felt better about their life after they had education. Education also helped them to control their blood glucose. Children and teenagers (aged 9 to 15) who got diabetes education had [haemoglobin A1c levels](#) that were about 0.5 percentage points (about 6 mmol/mol) lower than the levels in those who didn't get education. (The haemoglobin A1c blood test measures how well your diabetes is controlled.)

Most of the studies that looked at education for type 1 diabetes were small. And they all the studies looked at different programmes. So it's hard to say exactly what kind of education will help. ^[36]

Intensive treatment programmes

In this section

[Do they work?](#)

[What are they?](#)

[How can they help?](#)

[How do they work?](#)

[Can they be harmful?](#)

[How good is the research on intensive treatment programmes?](#)

This information is for people who have type 1 diabetes. It tells you about intensive treatment programmes, which are used for type 1 diabetes. It is based on the best and most up-to-date research.

Do they work?

Yes, if you have type 1 diabetes, an intensive treatment programme can help you control your diabetes better. But you may be more likely to get low blood glucose (hypoglycaemia).

What are they?

In an intensive treatment programme, you get help to keep your blood glucose as close to normal as possible. Intensive treatment is sometimes called tight control. You will: ^[41]
^[42]

- Check your own blood glucose often (usually at least four times a day)
- Take insulin injections at least three times daily, or use an [insulin pump](#) (for more information, see [Insulin therapy](#))

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- Have targets for your blood glucose levels at different times during the day
- Aim for a specific [haemoglobin A1c level](#) . Targets vary from person to person. A score of 6.5 percent (48 mmol/mol) or less is often recommended.
- Call your doctor or nurse often for advice on adjusting your insulin
- Be checked often at your diabetes clinic.

By comparison, if you're having standard diabetes treatment, you may take insulin injections once or twice a day, check your blood glucose once a day, and be checked by your diabetes clinic less often.

Having diabetes means you always have to balance between having a blood glucose level that's too high with one that's too low. Doctors have debated whether intensive treatment, where you try to keep your blood glucose as close to normal as possible, is a good idea. Now doctors believe it's the best way to avoid the complications that can happen with diabetes.

These are the target levels of blood glucose and haemoglobin A1c people aimed for in one intensive treatment trial. But your doctor might set different targets for you: ^[43]

Measure	Target
Blood glucose test before a meal	Between 3.9 and 6.7 mmol/L
Blood glucose test after a meal	Less than 10 mmol/L
Haemoglobin A1c test	Less than 6 percent (42 mmol/mol)

The term mmol/L is short for **millimoles per litre**. This is the way doctors describe how much glucose is in your blood.

The results of a haemoglobin A1c test can be given as a percentage or as mmol/mol, short for **millimoles per mol**.

How can they help?

An intensive treatment programme might lower your haemoglobin A1c level by about 1 to 2 percentage points (11 to 22 mmol/mol). ^[44] Haemoglobin A1c is a measure of how well your blood glucose is controlled over time.

Lower haemoglobin A1c levels mean your blood glucose is better controlled. You're much less likely to get complications from diabetes, if your blood glucose is well controlled. ^[42]

Studies that followed people for many years after they'd been in intensive treatment programmes found they were less likely to get damage to their eyes, feet, nerves, and kidneys, compared with people on standard treatment. They were also less likely to have

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high blood pressure, heart disease, or to have had a heart attack or a stroke. ^[42] ^[44] ^[45]
^[46] ^[47] ^[48] ^[49] ^[50] ^[51]

Not many good-quality studies have looked at whether intensive treatment programmes are suitable for children and adolescents. However, some research suggests that these programmes can lead to better blood glucose control and a lower risk of eye damage in teenagers. ^[42]

The people taking part in the programmes had a lot of support from doctors and nurses. We don't know whether people would be able to manage intensive treatment if they weren't on an intensive treatment programme.

How do they work?

Keeping your blood glucose as close as possible to normal means there are fewer times when you have too much glucose in your blood. Having too much glucose in your blood over a long period causes damage to your blood vessels. This can cause complications.

It's hard to keep your blood glucose close to normal. An intensive programme gives you support to check your blood glucose several times each day, take frequent injections of insulin (or use an insulin pump), and keep in close contact with your doctor or nurse. All of this might help you keep your diabetes under better control.

Can they be harmful?

The main problem with intensive treatment is that you may be more likely to get low blood glucose (**hypoglycaemia**). ^[41] ^[42] ^[52]

Hypoglycaemia can be dangerous. In another study, the chances of having a serious bout of hypoglycaemia that needed medical help was three times higher for people having intensive treatment. ^[42]

To find out more, see [hypoglycaemia](#) .

Some people are more likely to have hypos than others. And some people with diabetes just aren't good at spotting when they're having a hypo. If you're in one of these two groups, tight control might not be right for you.

People having intensive treatment are also more likely to gain weight. ^[53]

- You may gain 5 kilograms (11 pounds) more over about 10 years than if you get usual care.
- About half of the weight gain is likely to happen in the first year.

In some studies, people having intensive treatment with insulin pumps were more likely to get a condition called **ketoacidosis** (for more information, see [Hyperglycaemia](#)).
This can be very serious. Some people using insulin pumps died from ketoacidosis. ^[52]

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Ketoacidosis can happen if the insulin pump is faulty, or becomes accidentally disconnected, so you don't get the insulin you need. But this is less likely to happen with newer insulin pumps.

People having intensive treatment with insulin injections are no more likely to get ketoacidosis than people having standard treatment. ^[42] ^[54]

How good is the research on intensive treatment programmes?

We found three summaries of the research (called **systematic reviews**) that looked at thousands of people with type 1 diabetes. ^[44] ^[47] We also found several additional studies. ^[45] ^[46] ^[48] ^[49] ^[50] ^[51] ^[55]

The research shows that the average blood glucose levels of adults and teenagers having intensive treatment were lower than the average levels of people not having it. People having intensive treatment were also less likely to get complications from diabetes, including damage to their eyes, feet, nerves, and kidneys.

However, intensive treatment was more likely to cause episodes to low blood glucose levels, which can be dangerous.

Another summary that included more than 2,000 people having intensive treatment with insulin pumps. ^[52] It showed that people using insulin pumps were more likely to get a condition called **ketoacidosis**. (For more information on ketoacidosis, see [Hyperglycaemia](#) .)

There's no good-quality research on intensive treatment for children or teenagers.

Insulin pump

In this section

[Does it work?](#)

[What is it?](#)

[How can it help?](#)

[How does it work?](#)

[Can it be harmful?](#)

[How good is the research on insulin pumps?](#)

This information is for people who have type 1 diabetes. It tells you about insulin pumps, a treatment used for type 1 diabetes. It is based on the best and most up-to-date research.

Does it work?

Yes, probably. If you are an adult with type 1 diabetes, an insulin pump can help you control the level of glucose (sugar) in your blood better than having [insulin injections](#) several times a day.

What is it?

An insulin pump supplies your body with a constant stream of insulin. It's also known as **continuous subcutaneous insulin infusion** (CSII). The pump looks a bit like a pager.

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It's about the same size and shape as a pack of cards. You can put the pump in your pocket or you can hang it from your belt. You need to keep it with you all the time.

Inside the pump is a store of insulin. It is pumped out through a long tube. You connect the tube to a kind of needle that stays in your skin (a cannula). This gets the insulin into your bloodstream.

You might not like the idea of having something attached to you all the time. But most people get used to it. And you can disconnect the tube for short periods (for example, while you're having a shower, going swimming, getting dressed, or having sex).

For more information, see [Insulin therapy](#) .

The National Institute for Health and Care Excellence, the government body that decides which treatments should be available on the NHS, says insulin pumps should be used for children under 12, if it's impractical to give them several injections a day. ^[56]

NICE says pumps can be used in adults and children over 12 if: ^[56]

- They get too many episodes of low blood glucose (hypoglycaemia) from injections
- Their HbA1c is too high, despite using injections.

How can it help?

If you use an insulin pump rather than insulin injections: ^{[57] [58] [59] [60] [61]}

- You may have better blood glucose levels. Your [haemoglobin A1c level](#) may be lower by about 0.3 to 0.7 percentage points. (Doctors use this blood test to see how well your diabetes is controlled.)
- You may enjoy life more
- You may be less likely to get very low blood glucose (severe hypoglycaemia).

We didn't find any good-quality studies that focused on using insulin pumps to treat children and teenagers, although some of the studies looking at adults also included people under 18.

How does it work?

The pump supplies a steady trickle of insulin into your bloodstream. You can change the programme on the pump according to what you're doing. So, for example, you can give yourself a dose of insulin just before you eat a meal. This can help you control your blood glucose more closely, without needing to give yourself injections.

Some doctors think it may be especially useful for pregnant women, who need to keep a careful watch on their blood glucose. It may also be useful for teenagers who dislike

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injecting themselves several times a day, but who don't mind testing their blood glucose regularly or dealing with a pump.

Can it be harmful?

Taking insulin with a pump has some downsides.

When you're using an insulin pump, the tubing might accidentally come off the needle. If this happens, you stop getting insulin, but you may not notice immediately. This makes it more likely that you will get a condition called **ketoacidosis**. (For more information about ketoacidosis, see [Hyperglycaemia](#).) Ketoacidosis is serious. However, this problem is less likely with newer insulin pumps. ^[54]

Another problem with insulin pumps is that the needle can get infected. But if you change the needle and tubing every two or three days, this is less likely to happen.

How good is the research on insulin pumps?

Five summaries of the evidence (called **systematic reviews**) looked at studies comparing insulin pumps with having insulin injections. ^{[57] [58] [59] [61] [62]}

Overall, the reviews found that people using insulin pumps had slightly better diabetes control and had improvements in their quality of life. They were less likely to have episodes of extremely low blood sugar (severe hypoglycaemia).

Talking treatments

In this section

[Does they work?](#)

[What are they?](#)

[How can they help?](#)

[How do they work?](#)

[Can it be harmful?](#)

[How good is the research on talking treatments?](#)

This information is for people who have type 1 diabetes. It tells you about talking treatments, which are sometimes used for type 1 diabetes. It is based on the best and most up-to-date research.

Does they work?

We don't know. Most of the studies on talking treatments have been quite small and looked at different types of treatments. This means we can't compare their findings.

What are they?

These treatments involve meeting regularly with a therapist, counsellor, or another health professional. The goal is to help you cope better with your disease and manage your blood glucose levels. There are many different types of talking treatments, which may be offered in groups or one-to-one.

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Here are some of the talking treatments looked at in studies.

- Cognitive behaviour therapy (CBT): CBT is based on the idea that negative thoughts and beliefs play an important role in how you feel and act. CBT helps you identify and change unwanted thoughts, feelings, and behaviours. This treatment is sometimes provided as part of a diabetes education programme.
- Structured problem-solving: A therapist helps you identify and solve any problems you may be having (for example, difficulties monitoring and managing your blood glucose level).
- Family systems therapy: This type of treatment is for children with diabetes and their families. It often focuses on improving communication and adopting better ways to manage a child's or teenager's diabetes.

How can they help?

We don't know how well these treatments work. Most of the studies have been small and have looked at different treatments. ^{[63] [64] [65] [66] [67] [68] [69] [70] [71] [72] [73] [74] [75]}

This makes it difficult to compare their results and reach reliable conclusions about whether the treatments work.

However, there is some evidence that cognitive behaviour therapy may help people to lower their blood glucose levels by a small amount. ^{[65] [76]} Studies also suggest that family-focused therapy may improve teenagers' blood glucose control and quality of life. ^{[74] [77] [78]}

How do they work?

Diabetes is a serious illness. It takes a lot of time and effort to look after yourself, especially if you get extra problems (complications). On top of checking your blood glucose and taking insulin, you have to watch what you eat and take regular exercise. This can be difficult to manage, and you may find yourself feeling stressed and overwhelmed.

Talking with a therapist or counsellor about how you're feeling and how to work through problems may help you feel less stressed, enjoy life more, and better manage your disease.

Can it be harmful?

Only a few studies have looked at whether these treatments can be harmful. One found that people having cognitive behaviour therapy were more likely to get low blood glucose (hypoglycaemia). ^[64] But we need more research to confirm this.

How good is the research on talking treatments?

The research on talking treatments for type 1 diabetes isn't very good quality. We found one summary of the evidence (called a [systematic review](#))^[63] and several additional studies looking at talking treatments for adults and teenagers.^{[76] [65] [66] [67] [68] [69]}

^{[79] [77] [72] [78] [73] [75] [80] [81]} Most of the studies were small, including less than 100 people. They also looked at a wide range of treatments, which means we can't easily compare their findings to find out whether these treatments work. We need more research to know whether these treatments can help.

Further informations:

What is glucose?

Glucose is a type of sugar. Sucrose is another type of sugar: it's the type that people put on their food. Sugars are one form of a type of chemical called a carbohydrate. Starch is another type of carbohydrate.

- Foods like rice, pasta, and potatoes contain a lot of carbohydrates, which your body breaks down into glucose. You can also get glucose from fruits and vegetables.
- When you eat food, your digestive system breaks it down into a form that your body can use.
- The broken-down food products travel to your liver. Your liver turns them into glucose.
- Glucose goes into your bloodstream from your liver. The glucose can then be carried around your body.
- Your body uses glucose to supply your cells with the energy they need to work.

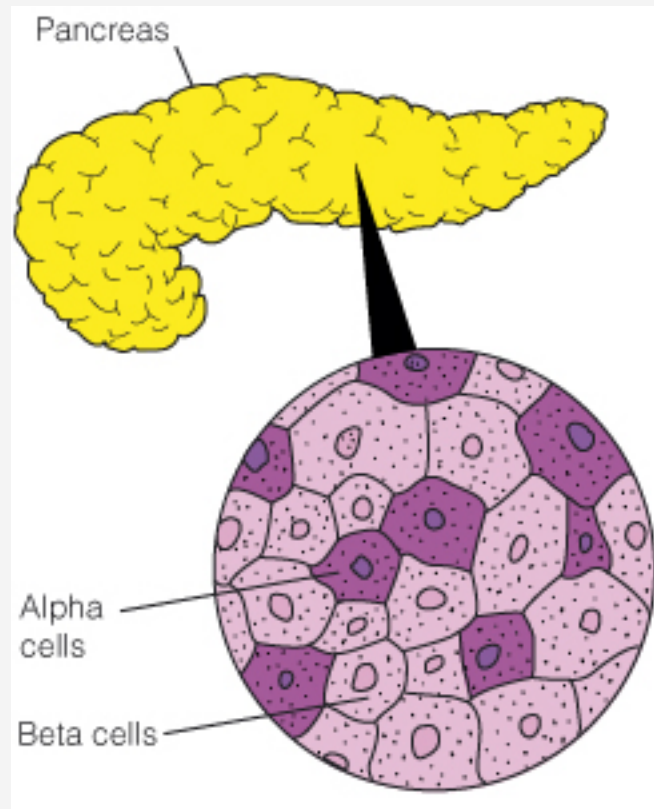
For more information, see [How does my body control my blood glucose level?](#)

How does my body control my blood glucose level?

Most people's bodies keep the amount of glucose (sugar) in their blood fairly constant. If the level gets too high or too low, you can become ill. For more, see [What are the symptoms of type 1 diabetes?](#)

And if your blood glucose level stays high over a long period of time, it can damage your heart, [kidneys](#), eyes, feet, and other parts of your body. See [What will happen to me?](#) to find out about these extra problems.

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In your pancreas, alpha cells make glucagon and beta cells make insulin.

Insulin and **glucagon** are two hormones that control how much glucose is in your blood. These hormones are made in your pancreas, a gland that sits just behind your stomach.

Your pancreas contains small groups of cells called the islets (or islands) of Langerhans. They are named after the German doctor who discovered them. These islets have two main types of cells:

- **Alpha cells** make glucagon.
- **Beta cells** make insulin.

What does insulin do?

When you eat, the amount of sugar in your blood rises. This causes the beta cells in your pancreas to make more insulin.

Almost all the cells in your body have special places on their surfaces that insulin sticks to. These are called **insulin receptors**. When insulin attaches to an insulin receptor, several things happen:

- Glucose enters your cells (to give them energy).

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- Your liver stops making glucose, and starts storing it until your body needs more energy.
- Cells in your muscles and in the fat under your skin pick up more glucose from your blood. This glucose is stored there until you need it.

All these things lower the level of glucose in your blood.

What does glucagon do?

Glucagon stops your blood glucose level dropping too low.

When you exercise, your muscles use the glucose in your blood for energy. Your pancreas senses that you're using up your glucose supply. As your blood glucose level drops:

- Your pancreas stops making insulin
- Your pancreas makes glucagon
- Glucagon makes your liver, your muscles and the fat under your skin release some of the glucose stored there.

These activities increase the level of glucose in your blood.

Other types of diabetes and high blood glucose

Impaired glucose tolerance

Impaired glucose tolerance (or IGT for short) is also called **prediabetes**. If you have this condition, your body may be slow at getting your blood glucose (sugar) level back to normal after you eat.

In healthy people, the level of glucose in their blood rises after eating. Then it drops down to normal in one or two hours. But if you have impaired glucose tolerance, it can take at least three hours for your blood glucose level to get back to normal after you eat.

Having impaired glucose tolerance also means you're more likely to get type 2 diabetes. You may also be more likely to get heart disease .^[5] If you have impaired glucose tolerance, your doctor will want to test your blood glucose level regularly. And he or she will talk to you about ways to lower your chances of getting diabetes.

Diabetes in pregnancy

Some women have high levels of glucose in their blood when they're pregnant but not at other times. This is called **gestational diabetes**. If you're a woman and you get this kind of diabetes, it can be harmful to both you and your baby if it isn't treated.

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Many women with diabetes in pregnancy can control their diabetes just by watching what they eat. Others have to take [insulin injections](#) during pregnancy. Ask your doctor which treatment is best for you.

If you have gestational diabetes, it will probably go away after your baby is born. But you're more likely to get [type 2 diabetes](#) later in life.

If you have diabetes and plan to become pregnant, discuss with your doctors ways to keep you and your baby healthy.

The metabolic syndrome

The metabolic syndrome isn't a disease. It's a group of features that are linked to your body's metabolism. Metabolism is the name given to all the chemical processes that take place in your body.

The metabolic syndrome is also known as **syndrome X** or **insulin resistance syndrome**.
^[6]

The most common features of the metabolic syndrome are:

- Excess body fat around the abdomen
- High levels of harmful fats in the blood
- Low levels of a "good" fat called high-density lipoprotein (HDL) cholesterol
- Blood pressure that is higher than normal
- Blood that clots too much
- Problems with how your body uses insulin . This means there may be too much sugar (glucose) in your blood.

If you have any of the features of the metabolic syndrome, your doctor will tell you what to do to stay healthy. Losing weight and doing regular exercise are important. Your doctor may advise you to make other changes in the way you live, and you may also need to take medicine.

If you have the metabolic syndrome, you are more likely to get [type 2 diabetes](#) , heart disease , a stroke and some other conditions.
^[6]

Hyperglycaemia

If you have type 1 diabetes, you have too much glucose in your blood. Treatment with insulin can keep your blood glucose at a normal level.

But it can be hard balancing how much insulin you take with how much food you eat. Even if you take insulin, you might have times when your blood glucose is too high. This is called **hyperglycaemia**.

See [Checking your blood glucose](#) to find out how you can keep an eye on your blood glucose level and avoid problems.

If your blood glucose is slightly raised from time to time, it's not usually a problem. You may need to adjust your dose of insulin or manage your diet better. If you often have slightly raised blood glucose levels, you'll need to talk to your doctor about adjusting your treatment.

But severe hyperglycaemia, where your blood sugar goes up very high, can be dangerous. This might happen if you miss a few doses of insulin: for example, if you're travelling and get confused about changing time zones. Or it might happen if you get an infection. Your body needs more insulin when you have an infection, even if you're not eating much. ^[7]

Severe hyperglycaemia can cause a condition called **ketoacidosis**. This happens when there's plenty of glucose in your body, but your cells can't use it because you don't have enough insulin. The glucose can't get into your cells, so they don't get the energy they need.

When this happens, your body tries to get energy from your fat instead. To turn fat into energy, your body makes chemicals called **ketones**. Ketones in your blood can be harmful. Your body tries to flush them out in your urine. You'll usually need medical help to get your blood glucose back to normal. ^[7]

These are the early symptoms of ketoacidosis: ^[8]

- Feeling very thirsty
- Needing to urinate very often.

These are more serious symptoms of ketoacidosis: ^[8]

- Feeling sick or vomiting
- Pain in your abdomen
- Feeling dizzy or confused

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- Getting low blood pressure
- Breathing heavily.

The ketones also make your breath smell fruity or sweet.

If you get any of these symptoms, it's best to get medical help. Your doctor may have already told you what to do. You may need to take a dose of short-acting insulin. But if you're not sure, call your doctor for help. ^[7]

If you have more serious symptoms, call an ambulance or go to hospital. Serious symptoms of ketoacidosis are a medical emergency. If your symptoms aren't treated properly, you could lose consciousness. This can be life-threatening. ^[7]

Checking your blood glucose

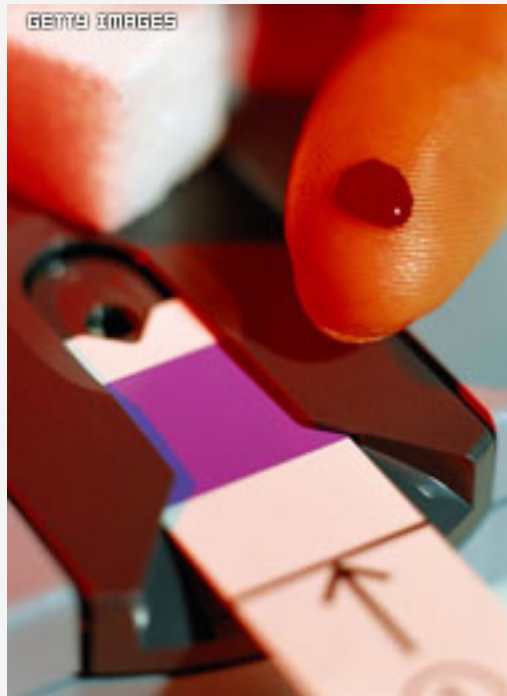
To control your diabetes, you need to get a good balance between the treatments you take, the food you eat and your exercise.

The best way to make sure your blood glucose stays within the range your doctor recommends is to keep checking it.

Regular checks of your blood sugar will also tell you if your blood glucose is dropping too low (**hypoglycaemia** or **hypo**) or climbing too high (**hyperglycaemia**). Both of these can be dangerous.

For example, if you're about to do some exercise and you find that your blood glucose level is quite low, you need to eat something before you exercise. If you don't eat anything, exercising could lower your blood glucose level even more. You could get hypoglycaemia. Some people call it "having a hypo".

Testing kits



You can test your own blood glucose level regularly using a simple kit.

There are kits to help you test your blood glucose. The kits make testing simple. Here's what you do.

- First, take some of your blood, usually one or two drops from your finger or your forearm. To get blood for the test, most people use a special needle that springs out when they press a button. You put this needle on your finger. When you press the button, the needle makes a prick that gives you exactly the right amount of blood.
- When you have a drop of blood on your finger, you touch the drop to a test strip. The test strip is usually held in place on a meter.
- There are many types of meter. But they all do the same thing. The meter analyses your blood. Then it tells you how much glucose is in it. The number usually shows up on a little screen on the meter.

Your doctor will help you decide how often to test your blood. You also need to decide when you will do the test. Some people need just one test a day. Others need to do it before they take their [insulin therapy](#) (three or four times a day). People who are having [intensive treatment](#) need to have a test three or four times a day.

You also need to adjust your insulin dose or your activities based on what you find in your test. You will get used to this over time. But if you're not sure what to do, call your diabetes nurse or your doctor for advice.

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It's a good idea to keep track of your blood glucose level over a period of time. This will help your doctor see how you're controlling your diabetes. You can carry a notebook with you to write this down. Or you can plot your blood glucose levels onto a graph. This will help you see how your levels change. Also, most modern meters have an internal memory. This means that you don't have to keep a record yourself. You can simply show the meter to your doctor. Some meters connect to a computer, so the records simply download onto the computer without you needing to do anything.

Keeping a record of your blood glucose level helps your doctor decide if you need to change your treatment, change to a different kind of insulin or change when you give yourself insulin (this is called your dosing schedule). For example, when you go to bed, you might find that your blood glucose is always a little bit higher than it should be. If this happens, your doctor may advise you to take more insulin before your evening meal. ^[9]

If you are having difficulty managing your glucose levels, your doctor might recommend trying **continuous glucose monitoring (CGM)**. This involves wearing a device with a sensor that goes under your skin and records your glucose levels throughout the day. The device can also alert you if your glucose levels are becoming too high or too low.

Haemoglobin A1c test

Another test you'll get used to is the test for haemoglobin A1c (HbA1c for short). Haemoglobin A1c is a chemical found in your blood. You might hear it called **glycated haemoglobin, glycosylated haemoglobin, or glycohaemoglobin**.

Your haemoglobin A1c level gives your doctor an idea of what your glucose level has been over time. It is kind of an average of your blood glucose level over the previous weeks. If your blood glucose level is often higher than normal, you will also have a high haemoglobin A1c level. So this test is useful for seeing how well your diabetes is under control. Most people with diabetes should have their haemoglobin A1c checked every three months to six months.

The higher the number, the greater your chance of getting [complications](#) from your diabetes. If you can keep your haemoglobin A1c below 7.5 percent (59 mmol/mol) you are less likely to get complications. You may want to aim for a lower number, but you should discuss this with your doctor. ^[10]

Driving

If you take insulin, you must inform the Driver and Vehicle Licensing Agency (DVLA) about your diabetes. You must also tell the DVLA if you have a complication that could affect your driving, such as a problem with your eyes. If you don't, your driving licence and car insurance may no longer be valid. ^[11]

You need to be especially careful about checking your blood glucose level when you're driving. If it drops too low when you're at the wheel, you could get hypoglycaemia (have a 'hypo') and black out. To reduce your chances of getting hypo while driving, check your blood glucose level just before you get into the car. ^[12] If it is low, have a snack and check

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your blood again before you set off. Try to always have some sugary drinks or sweets in the car. If you feel you're going into a hypo, you can stop the vehicle and have a drink or sweet, to boost your blood glucose.

If you feel you're going into a hypo while you're driving: ^[12]

- Stop the vehicle in a safe place
- Switch off the engine
- Have a sweet drink or snack, such as a sweet or glucose tablet. Wait until you feel better before setting off. This can take 15 minutes
- It's a good idea to check your blood again before driving.

Hypoglycaemia

If you have type 1 diabetes, you have too much glucose in your blood. Treatment with insulin can keep your blood glucose at a normal level.

But it can be hard balancing how much insulin you take with how much food you eat, and how much exercise you do. Sometimes people get it wrong, and their blood glucose drops too low.

When your blood glucose drops too low, it's called **hypoglycaemia**. It happens as a side effect of treatment with insulin. Some people call it "having a hypo".

Most people learn to handle mild hypoglycaemia themselves, by eating or drinking something sugary. But severe hypoglycaemia can be life-threatening, if you don't get treatment quickly.

See [Checking your blood glucose](#) to find out how you can keep an eye on your blood glucose level and avoid problems.

For most people, blood glucose is too low when it's less than about 4 millimoles per litre (mmol/L for short). Your doctor may talk about your blood glucose level using just the number. For example, your doctor may say, "Your blood glucose is 4."

But you may get symptoms of hypoglycaemia when your blood glucose is below or above this level. Everyone's need for glucose is slightly different. Ask your doctor what is the right blood glucose level for you. To learn more about why your body needs glucose, see [What is diabetes?](#)

Severe hypoglycaemia can make you lose consciousness (black out) and go into a coma. If you don't get treatment, you may die. But dying from hypoglycaemia is very rare. ^[4] Your doctor will give you advice on how to avoid severe hypoglycaemia.

What causes hypoglycaemia?

Here are some of the things that can cause hypoglycaemia.

Too much insulin or too little food: Most people get hypoglycaemia when they accidentally use too much insulin. For example, if you think you're going to eat a big meal, you may give yourself insulin just before you eat. But if you eat much less than you thought you would, you'll end up with too much insulin in your blood. This will make your blood glucose drop too low. Try to match the amount of insulin you take with the amount and type of food you're going to eat. For tips on taking insulin, see [Insulin therapy](#) .

Exercise: Your body uses up more glucose when you exercise, so you may need less insulin. If you know you're going to an exercise class, for example, you should take less insulin than you usually would and have a snack. You need to check your blood sugar before and after the class.

Illness: Your body usually needs more insulin when you're ill, so you may have to increase your dose of insulin. But it's not always easy to know exactly how much you need. ^[4]

Alcohol: Alcohol lowers your blood glucose. So you need to be especially careful when you drink. Don't drink on an empty stomach, and limit how much alcohol you drink.

Intensive treatment of your blood glucose: Some people with diabetes watch their blood glucose level closely and try to keep it as normal as possible. This is called intensive treatment, or tight control. (For more information, see [Intensive treatment programmes](#) .) It has advantages in preventing complications. But if you use intensive treatment, you may be more likely to get hypoglycaemia.

Action points: how to recognise hypoglycaemia

You may feel: ^[21]

- Weak
- Drowsy
- Shaky
- Nervous
- Confused.

You may also:

- Feel hungry
- Feel dizzy or light-headed

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- Feel sweaty
- Feel your heart pounding
- Turn pale
- Get a headache
- Become irritable
- Behave oddly
- Have difficulty speaking
- Start shaking
- Start sweating
- Feel cold and clammy.

Action points: what to do if you have hypoglycaemia

- Treat your symptoms quickly. ^[21]
- Eat or drink something sugary, such as sweets or a sweet drink. You need five to six sweets, about one-third of a chocolate bar, or at least half a cup of sugary drink. Or you can eat three or four glucose tablets.
- Don't eat or drink too much sugar if your symptoms are mild. Be patient. It takes 10 to 15 minutes to feel better.
- Test your blood glucose afterwards and see if it's still low. Test it again after 15 minutes. If it's still low, or if you still feel the symptoms of hypoglycaemia, eat some more sugar.
- Call an ambulance if your blood glucose is very low and you can't seem to come out of the hypo. This is a medical emergency.

Action points: how to avoid hypoglycaemia

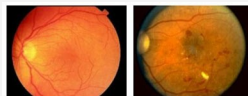
- Talk to your doctor about what blood glucose level you should aim for.
- Ask your doctor how often you should test your blood glucose.

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- Stay in tune with your body. Some people can't spot the symptoms of hypoglycaemia after they've had diabetes for a while. And your symptoms can change over time. Try to listen to your body and note what happens to you when your blood glucose drops. This will help you know when to act.
- It's hard to keep your blood glucose stable when your daily routine changes, for example, if you go on holiday, or if you get sick. You may need help from your doctor to work out how much insulin to take at these times.
- Keep some sugary food with you at all times.
- If your doctor thinks that you're at risk of severe hypoglycaemia, he or she may prescribe a glucagon injection to carry with you. ^[22] This injection helps release a burst of glucose into your blood. Your friends and family should be taught to spot the signs of hypoglycaemia, and they should be ready to use the glucagon injection.
- Remember that hypoglycaemia can be serious. Most people can treat the symptoms quickly and get back to normal. But some people die from severe hypoglycaemia, if it's not treated quickly enough.

Eye problems in diabetes

Diabetes can cause damage to the delicate blood vessels in the backs of your eyes. Doctors call this problem **retinopathy**.



Inside a normal eye (left) and an eye with retinopathy (right). The yellow spots and red spots are signs of damage.

An eye doctor can look at the backs of your eyes to see if you have any problems. If you get blurred vision or other problems with your sight, tell your doctor straight away.

If your retinopathy isn't treated, you might go blind.

The good news is that if your eye problems are picked up early and treated with laser therapy, you're unlikely to go blind. ^[3]

To reduce your chances of losing your sight:

- Have your eyes examined every year if you're over 11 years old
- If you're a woman planning to have a baby, have an eye exam before getting pregnant

Diabetes, type 1

- Stop smoking
- Keep your blood glucose (sugar) level and your **blood pressure** as close to normal as possible
- Tell your doctor straight away if you have any problems with your sight. You might see dark spots, flashing lights, or rings around lights. These can be signs that you have retinopathy.

Kidney problems in diabetes

Your kidneys help your body get rid of waste products. They work like sieves. In your kidneys, waste products are filtered out of your blood into your urine. Your blood also contains cells and particles called **proteins**, which you need. These are normally too big to go through your kidneys, so they stay in your blood.

Your kidneys also help keep the amounts of water and salt in your blood fairly constant.

Having too much glucose (sugar) in your blood can harm your kidneys over time. The filtering cells in your kidneys get damaged and start to leak. This lets the larger particles (cells and proteins) escape from your blood into your urine.

Your doctor may tell you that you have **microalbuminuria** or **proteinuria**. This means that some protein is passing through your kidneys when it shouldn't. It's a sign that your kidneys are damaged.

Over time this damage can lead to **kidney failure**. This means your kidneys stop working. If this happens, you'll need **dialysis** (using a machine to clean your blood) or a kidney transplant. But most people with diabetes don't get kidney failure.

Doctors have learned how to stop kidney damage happening, so fewer people with diabetes get kidney failure. You should have regular checks for protein in your urine.

About 2 in 5 patients with type 1 diabetes get microalbuminuria after five years to 10 years.^[4] If this happens to you, you may be able to stop further damage to your kidneys by carefully controlling your diabetes.

You may also be given drugs to keep your **blood pressure** down. This will help keep your kidneys healthy. If you do have protein in your urine, your doctor may give you tablets to help protect your kidneys from more damage.

Action points

- Watch your blood glucose levels closely. For more, see [Checking your blood glucose](#)

Diabetes, type 1

- Watch your blood pressure. If it is high, you may need to take drugs to treat it. Two groups of drugs used to treat high blood pressure, called ACE inhibitors and angiotensin II receptor antagonists, can slow kidney damage, even if you don't have high blood pressure.
- Ask your doctor or your dietitian if you should eat less protein (meat, cheese, milk, or fish) or fewer eggs.
- See your doctor straight away if you get an infection in your bladder or in your kidneys. Signs of an infection in these areas are cloudy or bloody urine, pain or burning when you urinate, or having to urinate often or in a hurry. Back pain, chills, and fever are other signs that you might have an infection in your kidneys.
- If you smoke, stop.

Nerve damage in diabetes

Over time, high levels of glucose (sugar) in your blood can stop your nerves sending signals from your limbs (especially your legs and feet) to your brain. Other nerves, called **autonomic nerves**, can also become damaged. Autonomic nerves control many functions in your body, such as your heartbeat, digestion, and blood pressure.

About half of people who have had diabetes for a long time will get some kind of nerve damage.^[4] This nerve damage is called **diabetic neuropathy**.

Nerves in your arms, legs, and feet

Damage to nerves in your arms and legs can lead to:

- Numbness
- Pins and needles
- A burning feeling (you might not be able to bear anything touching your feet)
- Pain
- Feeling cold.

You might not be able to feel your toes or your feet. Or you might have painful and burning feet. Nerves in your legs and arms also can get damaged. If this happens, you might have numb areas or get shooting pains in your arms or legs, especially at night.^[23]

Your feet are most at risk. You may get the following problems in your feet:

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- You can't feel pain
- You can't feel hot or cold
- You get foot ulcers (areas of broken skin that don't heal)
- Your foot swells
- The shape or position of your foot changes, and you can't use it properly.

If you have damaged nerves, you may not notice if you get a cut or a sore on your foot. This means that small sores can turn into serious problems because you don't know they're there. If you also have poor blood circulation (see [Heart and blood problems in diabetes](#)), your wounds can take longer to heal.

For example, you could be walking around barefoot and step on a nail. Nerve damage in your foot means you don't feel this, and your wound gets infected. Because there's lots of glucose in your blood, the germs that get into your wound grow fast. So the infection gets worse.

Rarely, a bad infection can cause **gangrene**. This is when the tissue around the wound dies. If it's not treated the gangrene may spread. In extreme cases, people with gangrene need to have part of their foot or leg removed. This is called an amputation. However, these days it's not common for people with diabetes to need an amputation.

Nerves in other parts of your body

If you've had diabetes for a long time, nerves in other parts of your body may get damaged.

Your heart: If the nerves in your heart are damaged, your heart may not work as well as it should. This means you're more likely to have a heart attack. You may also find that your blood pressure changes. And you may feel dizzy if you stand up suddenly. Nerve damage to your heart can also mean you don't get chest pain if you have a heart attack. This makes it hard to know that you're having one.

Your digestive system: This includes your throat, stomach, and intestines. Damage to nerves in these parts of your body can affect how fast your food passes through. You may get diarrhoea or constipation.

Your genital area: If the nerves in this area are damaged, you can get sexual problems. You may not feel like having sex. If you're a man, you may not be able to get or keep an erection. If you're a woman, you may have trouble getting aroused or having an orgasm. These problems are more likely if you have had diabetes for a long time.^[4] If the nerves in your bladder are damaged, you may have problems controlling when you pass urine.

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Your skin: Certain nerves control when you sweat. If these nerves are damaged, you won't sweat as much as you should. This makes your skin drier and more fragile, especially the skin on your feet.

Action points

Here are some tips for keeping your nervous system in good shape.

- Keep your [blood glucose level](#) and your blood pressure as close to normal as possible. Your doctor will help you do this.
- Don't drink too much alcohol. Too much alcohol can cause nerve damage.
- Check your feet every day, especially if you can't feel them well.
- If you smoke, stop.

Here are some more tips to protect your feet:

- Check your bare feet every day.
- Look for cuts, sores, bruises, or spots. See your GP or diabetes nurse or doctor if you find any problems.
- If you have difficulty seeing the bottoms of your feet, use a mirror. Or ask someone to help.
- Wash your feet in warm water every day using mild soap. Don't soak your feet, as this can dry your skin. Don't have very hot baths.
- Dry your feet with a soft towel. Pay close attention to the areas between your toes.
- After washing your feet, cover them with a lotion (such as baby lotion) before putting your shoes and socks on. (But don't put lotion or cream between your toes.) Your feet will be drier than normal, because diabetes makes you sweat less.
- File your toenails straight across, using a nail file. Make sure you don't leave sharp edges that could cut the next toe. A podiatrist can help show you how to best care for your toenails.
- Don't try to remove corns, calluses, or warts yourself. See a foot doctor (a chiropodist or podiatrist) instead.
- If your feet have changed shape, wear trainers or shoes that are extra deep or wide. Or you can get specially moulded shoes that cushion your feet and let your toes move.

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- Don't wear flip-flops or plastic shoes. Avoid shoes with pointed toes or high heels. Never go barefoot.
- Check your shoes before you put them on. Make sure they don't have any sharp edges or objects in them.
- Don't wear stockings or socks with holes, seams, or repairs that might rub against your feet.
- Don't put heating pads or hot water bottles next to your feet. If your feet get cold at night, wear thick socks.
- Make sure a nurse or doctor checks your feet and the feeling in your feet regularly.

Heart and blood problems in diabetes

Heart disease is the biggest problem for people with diabetes. Having diabetes makes it more likely that you will have a heart attack or a stroke . They are the most common reasons why people with diabetes die.

If you have diabetes, you're two to four times more likely to die of heart disease than someone who doesn't have diabetes. ^[24] Heart disease can also cause problems with blood flow (circulation) in your legs and feet.

Unfortunately, diabetes tends to give you more bad fats and cholesterol in your blood. High cholesterol , high blood pressure , and smoking all make it more likely that you'll get a condition called atherosclerosis . This is when the walls of your blood vessels become thicker. It makes it harder for blood to flow through your blood vessels. If you have atherosclerosis, you're more likely to have a heart attack or a stroke.

If you have diabetes, your doctor should check your blood pressure and cholesterol regularly. You may need to have treatment if either of these is too high (or too low). Your doctor should also check that blood is flowing well through your legs, feet, and neck.

Your doctor will probably tell you to follow a low-fat diet. The aim is to lower the amount of bad fats in your blood. See [Advice on healthy living](#) .

Action points

- If you smoke, stop.
- If you have high blood pressure, you need treatment. Get it checked.
- If you have high cholesterol, you need treatment. Get it checked.

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- Watch your blood glucose level closely. See [Checking your blood glucose](#) .
- If you're overweight, lose some weight.
- Take regular exercise.
- Your doctor may suggest you take a low dose of aspirin every day.

We've prepared some more detailed information for people with diabetes who want to know more about heart and blood problems. For more information, see [Preventing heart and circulation problems in diabetes](#) .

Advice on healthy living

Keeping your diabetes under control is important. If it isn't kept under control, you can get serious health problems. You could go blind or have kidney failure . So you need to keep your blood glucose (sugar) level as close to normal as possible. That doesn't just mean taking your insulin. Eating healthily and staying active can also help keep your blood glucose level near normal.

What you eat

Doctors used to tell people with diabetes to stop eating sugary foods. Now the advice is to eat a healthy, low-fat diet. This means eating regular, well-balanced meals, and sticking to a certain number of calories each day. Eating the right amounts of healthy foods and keeping your weight in the right range for your height will help you control your diabetes.

[25]

There are six kinds of food that fit into what nutritionists call the food pyramid: [26]

- Grains
- Vegetables
- Fruits
- Milk (low fat is best)
- Meat and beans
- Oils.

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Try to eat foods from each group every day. By doing this, you will make sure that your body has all the nourishment it needs.

You need to include lots of starchy foods, fruit, and vegetables in your diet. And you need to eat fewer sweet foods, fats, and proteins.

Below are some tips to help you eat healthily and keep your weight down.

Action points for healthy eating

Your GP or hospital doctor should refer you to a dietitian, who can help you make a food plan that suits you.^[27] A good meal plan should fit in with your schedule and eating habits. The right plan will also help you keep your weight in the healthy range.

- Eat regular meals based on starchy foods such as bread, pasta, chapatis, potatoes, rice, and cereals. Choose whole-grain kinds when you can.
- Cut down on the fat you eat. Choose low-fat dairy foods like skimmed milk and low-fat yoghurt. Grill, steam, or bake foods instead of frying.
- Eat more fruit and vegetables. Aim for at least five portions a day.
- You can eat fatty foods and sweets, but try not to eat them too often. Look at biscuits, pastries, cakes, puddings, fizzy drinks, mayonnaise, salad dressings, butter, and oils as treats rather than everyday foods.
- Every day try to eat two portions of meat, fish, or similar foods, such as eggs, pulses, beans, and nuts. Choose lower-fat kinds when you can. Oily fish such as salmon, mackerel, pilchards, trout, and herring are especially good for you. Try to eat two portions of these types of fish each week.

Exercise

If you haven't exercised much in the past, making exercise part of your life might seem hard. You might feel you're too old to change your habits. Getting started is probably the hardest part.

Exercise has great benefits. It will help keep down the level of glucose in your blood. It will also help keep your weight down, and it can make you feel great.

Be sure to talk to your doctor before starting or changing an exercise programme. Most doctors advise their patients to do some kind of exercise every day. This doesn't need to be strenuous. Walking for 30 minutes each day might be all you need to do.

If you do any vigorous physical activity, such as taking an exercise class or playing squash, you may find that your blood glucose level changes a lot afterwards. See the

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action points below for some tips on how to avoid letting your glucose level go too high ([hyperglycaemia](#)) or too low ([hypoglycaemia](#)) during or after exercise. ^[8]

Action points for exercising

How to get started exercising:

- Taking a brisk walk each day might be enough to keep you fit and healthy
- You might enjoy swimming or joining a fitness class.

How to exercise safely:

- Ask your doctor what type of exercise is best for you
- Also ask your doctor if you need to change your insulin when you exercise. Exercise uses up glucose, so you might need to take less insulin or take it later.

How to avoid hypoglycaemia and hyperglycaemia when you exercise:

- Check your blood glucose before, during, and after you exercise. For more, see [Checking your blood glucose](#) .
- Wait to start exercising if your blood glucose level is more than 15 mmol/L or less than 5.5 mmol/L (The term mmol/L stands for millimoles per litre. It's the way doctors measure your blood glucose.)
- Eat a meal one hour to three hours before you exercise
- If you plan to exercise for a long time, have a carbohydrate snack (such as a banana or a sandwich made with brown bread) at least every 30 minutes
- Take less insulin than normal or have a snack before you exercise. You can talk about this with your doctor
- If you inject your insulin, inject it into an area of your body that you won't be using. For example, inject it into your stomach if you're going running
- Learn how your body responds to different types of exercise. Then adjust your eating and treatment to match
- If you have exercised hard, eat more over the next 24 hours. This will help replace the glucose you've used up
- Talk to your doctor about whether you need an exercise test (stress test) before you start an exercise programme

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- You may not be able to exercise if you have some types of [eye problems](#) . Check with your doctor
- If you have bad [nerve problems](#) in your feet, you may need to do exercise that doesn't involve standing on your feet. For example, you may need to swim instead of walk.

Infections in diabetes

If you have diabetes, you're more likely to get some types of infections . Also, diabetes can make your blood circulation more sluggish. So infections might take longer to clear.

You're more likely to get infections in these parts of your body:

- Your [kidneys](#) or your bladder^[28]
- Your skin^[4]
- Your teeth or gums
- And if you're a woman, in your vagina.

An infection in your gums can give you a condition called **gingivitis**. This is when your gums get sore and swollen. If infections in your teeth or gums aren't treated, your teeth may get loose and fall out.

You may also get more ill than someone without diabetes if you get [pneumonia](#) or flu.

Action points

- Keep your blood glucose level as close to normal as possible. This makes it less likely that you'll get an infection.^[4] For more, see [Checking your blood glucose](#) .
- Get a flu jab every year.
- Ask your GP about a [vaccination](#) against pneumonia.
- Take good care of your teeth and see your dentist regularly. This can help stop you getting gum infections and bad teeth.
- If you get a fever, cough, pain when you urinate, or another symptom of an infection, see your doctor straight away.

Psychological problems in diabetes

Diabetes is a serious illness. It takes a lot of time and effort to look after yourself, especially if you get extra problems (complications). On top of [checking your blood glucose](#) and taking insulin, you have to watch what you eat and take regular exercise.

Also, you may have to see your GP, hospital specialist, or diabetes nurse quite often. And you may have to visit hospital clinics for treatment on your eyes, kidneys, or heart. This can make family life complicated. And it may affect your ability to do the job you want to do.

All of these stresses can take a toll. You may get [depressed](#), especially if you have other health problems or a disability.^[9] If you feel stressed or depressed, talk to your doctor. Depression can be treated, and you can get advice about how to cope with your diabetes.

You may find it helps to talk to other people who have diabetes. Someone from your diabetes team may be able to put you in touch with a support group in your area.

Yearly check-up for diabetes

If you have diabetes, you should have certain tests and see your doctor every year to stay as healthy as possible.^[31]

Here are some tests you should have at least once a year:

- A test of your blood glucose control: Doctors usually use a haemoglobin A1c blood test to see how well treatment is controlling the level of glucose (sugar) in your blood. Targets vary, but you'll probably be aiming for 6.5 percent (48 mmol/mol) or lower on this test. For more, see [Checking your blood glucose](#).
- A test to see how your kidneys are working: Blood and urine tests for [protein](#) will show if your [kidneys](#) are working properly.
- A cholesterol test: A blood test for [cholesterol](#) can tell if your level is too high.
- A photograph of the back of your eye: The photograph is then examined to check for damage to the blood vessels at the back of your eye, called diabetic retinopathy. If you live in England, you can find out how to get this test by looking at the NHS website (<http://diabeticeye.screening.nhs.uk/>). Otherwise, talk to your doctor.

Here is a list of things your doctor will check during your examination:

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- **Your weight:** Your doctor will work out your body mass index (BMI for short). This looks at both your weight and your height. It shows if you need to lose weight to control your diabetes better.
- **Your legs and feet:** Your doctor will examine your skin and will check to see if your circulation and nerves are working properly. You may need to see a chiropodist or podiatrist if you have any problems in these areas.
- **Your blood pressure:** Your doctor will take your blood pressure . If it gets high, you can have problems. You should aim for 140/80 or less.
- **Your injection areas:** Your doctor will examine the areas where you give yourself insulin injections.

You should also have time to discuss with your doctor:

- How you're coping
- Your treatment
- How well your diabetes is controlled
- Any problems you're having.

Glossary:

kidney

Your kidneys are organs that filter your blood to make urine. You have two kidneys, on either side of your body. They are underneath your ribcage, near your back.

hormones

Hormones are chemicals that are made in certain parts of the body. They travel through the bloodstream and have an effect on other parts of the body. For example, the female sex hormone oestrogen is made in a woman's ovaries. Oestrogen has many different effects on a woman's body. It makes the breasts grow at puberty and helps control periods. It is also needed to get pregnant.

gland

A gland is any group of cells in the body that makes and releases something for use by another part of the body. For example, the thyroid gland makes a hormone called thyroxine. This acts on receptors within cells. By acting on the receptors it gives the cells a message to speed up their metabolism and work harder.

immune system

Your immune system is made up of the parts of your body that fight infection. When bacteria or viruses get into your body, it's your immune system that kills them. Antibodies and white blood cells are part of your immune system. They travel in your blood and attack bacteria, viruses and other things that could damage your body.

pancreas

Your pancreas is an organ that's behind your stomach. It makes several different chemicals. Some of the chemicals help your body digest food. Your pancreas also makes a chemical called insulin, which helps your body use the sugar in your blood.

liver

Your liver is on the right side of your body, just below your ribcage. Your liver does several things in your body, including processing and storing nutrients from food, and breaking down chemicals, such as alcohol.

viruses

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Viruses are microbes (tiny organisms) that need the cells of humans or other animals to exist. They use the machinery of cells to reproduce. Then they spread to other cells in the body.

rubella

Rubella is a childhood infection caused by a virus. It usually starts with mild cold symptoms, a sore throat and swollen glands. After that, you get a pink rash that spreads from your head to the rest of your body. Some people call it German Measles. The measles, mumps and rubella (MMR) vaccine protects children from getting rubella.

hand-foot-and-mouth disease

Hand-foot-and-mouth disease is a common problem, particularly in young children. It happens when they get infected with a certain type of virus. They get a fever and bumps or blisters on their tongue and mouth. They also get tender bumps on their hands, feet and buttocks. They may get these bumps in their genital area. Hand-foot-and-mouth disease usually comes on suddenly, and clears up in a few days.

genes

Your genes are the parts of your cells that contain instructions for how your body works. Genes are found on chromosomes, structures that sit in the nucleus at the middle of each of your cells. You have 23 pairs of chromosomes in your normal cells, each of which has thousands of genes. You get one set of chromosomes, and all of the genes that are on them, from each of your parents.

heart disease

You get heart disease when your heart isn't able to pump blood as well as it should. This can happen for a variety of reasons.

blood pressure

Blood pressure is the amount of force that's exerted by your blood on to your blood vessels. You can think of it like the water pressure in your home: the more pressure you have, the faster and more forcefully the water flows out of the shower. Blood pressure is measured in millimetres of mercury (written as mm Hg). When your blood pressure is taken, the measurement is given as two numbers, for example 120/80 mm Hg. The first, higher, number is called the systolic pressure, and the second, lower, number is the diastolic pressure. The systolic number is the highest pressure that occurs while your heart is pushing blood into your arteries. The diastolic number is the lowest pressure that happens when your heart is relaxing and is not pushing your blood.

insulin

Insulin is a hormone that helps your body use glucose. Glucose is a type of sugar that gives you energy. Insulin keeps the levels of glucose in your body steady. Insulin also helps glucose to be carried in your blood, so that the glucose can get into your cells. People who have diabetes do not have enough insulin or do not react to insulin strongly enough. This means they can get too much glucose in their blood.

stroke

You have a stroke when the blood supply to a part of your brain is cut off. This damages your brain and can cause symptoms like weakness or numbness on one side of your body. You may also find it hard to speak if you've had a stroke.

laser therapy

Laser therapy is when surgeons use a laser to perform certain operations. For example, diabetes can make people grow new blood vessels in their eyes, which can affect their sight. Laser surgery can be used to remove these blood vessels.

proteins

A lot of your body's tissues are made out of proteins. Proteins can be made in your cells. Proteins are also part of the food you eat, particularly meat and dairy products. Your body breaks down the protein you eat into amino acids. Your cells then use these amino acids to build new proteins, which make up muscles, joints, hair and other parts of your body.

kidney failure

Kidney failure is when your kidneys can't make urine properly. Kidney failure happens because of kidney disease. People with kidney failure need to have dialysis, which is a way to get rid of the substances in your blood that normally go in your urine.

ACE inhibitors

ACE inhibitors are drugs used mainly to lower blood pressure and reduce strain on your heart. ACE stands for 'angiotensin converting enzyme'. Angiotensin is a chemical that can make your blood vessels narrower. ACE inhibitors stop this happening, which helps to lower your blood pressure.

angiotensin II receptor antagonists

This class of drugs works similarly to ACE inhibitors to reduce blood pressure and strain on your heart. Angiotensin II receptor antagonists, also called angiotensin receptor blockers (ARBs), work by blocking the formation of angiotensin II, a substance that makes blood vessels narrower. Stopping it from being made helps to lower blood pressure.

infection

You get an infection when bacteria, a fungus, or a virus get into a part of your body where it shouldn't be. For example, an infection in your nose and airways causes the common cold. An infection in your skin can cause rashes such as athlete's foot. The organisms that cause infections are so tiny that you can't see them without a microscope.

bladder

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Your bladder is the hollow organ at the top of your pelvis that stores urine. It is similar to a balloon, only with stronger walls. It fills up with urine until you go to the toilet.

acute myocardial infarction

Acute myocardial infarction is what doctors call a heart attack. A heart attack is when your heart muscle gets damaged because it isn't getting enough blood and oxygen. This can happen if a branch of your coronary arteries becomes blocked. During a heart attack, you may have pain or heaviness over your chest, and pain, numbness or tingling in your jaw and left arm.

diarrhoea

Diarrhoea is when you have loose, watery stools and you need to go to the toilet far more often than usual. Doctors say you have diarrhoea if you need to go to the toilet more than three times a day.

cholesterol

Cholesterol is a fat-like substance made by your liver or absorbed from food. It is used by your body to make bile acids (which help your intestines absorb nutrients) and steroid hormones (like testosterone or oestrogen). Cholesterol is also an important part of cell membranes, which are the structures that surround cells. 'Good cholesterol' is called HDL; 'bad cholesterol' is LDL.

high cholesterol

If you've been told that you have high cholesterol it usually means that your total cholesterol level is 5mmol/l or higher. But doctors also look at the amount of good (HDL) and bad (LDL) cholesterol you have in your blood. Having high levels of bad cholesterol can make it more likely that you'll get certain diseases in your heart and arteries.

high blood pressure

Your blood pressure is considered to be high when it is above the accepted normal range. The usual limit for normal blood pressure is 140/90. If either the first (systolic) number is above 140 or the lower (diastolic) number is above 90, a person is considered to have high blood pressure. Doctors sometimes call high blood pressure 'hypertension'.

atherosclerosis

Atherosclerosis is also called 'hardening of the arteries'. It happens when fatty material sticks to the inner wall of your arteries. Over time, cholesterol, fats and other things in your blood stick to the same area and the artery wall becomes thick and narrow, making it progressively more difficult for blood to flow through the affected vessels.

pneumonia

Pneumonia is an infection in your lungs. Anything that causes infections (bacteria, viruses or fungi, for example) can give you pneumonia.

vaccination

A vaccination is an injection a doctor can give you to protect you from getting an infectious illness (an illness that spreads between people).

thyroid gland

Your thyroid gland is a small organ that sits in your neck, just in front of your windpipe. It sends out a hormone called thyroxine. This acts on receptors within cells. By acting on the receptors it gives the cells a message to speed up their metabolism and work harder.

bacteria

Bacteria are tiny organisms. There are lots of different types. Some are harmful and can cause disease. But some bacteria live in your body without causing any harm.

yeasts

Yeasts are a type of fungus. They can cause infections in your body, such as thrush.

puberty

Puberty is the time when boys and girls develop secondary sexual characteristics. For boys, the major changes include pubic hair, a deeper voice, and growth of their penis and testicles. For girls, major changes include pubic hair, breasts and starting to have periods. After puberty, girls are able to become pregnant and boys are able to father children.

arthritis

Arthritis is when your joints become inflamed, making them stiff and painful. There are different kinds of arthritis. Osteoarthritis is the most common type. It happens when the cartilage at the end of your bones becomes damaged and then starts to grow abnormally. Rheumatoid arthritis happens because your immune system attacks the lining of your joints.

systematic reviews

A systematic review is a thorough look through published research on a particular topic. Only studies that have been carried out to a high standard are included. A systematic review may or may not include a meta-analysis, which is when the results from individual studies are put together.

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