



Insulin

Things You Should Know

This information has been designed to answer some of the questions you may have about starting on insulin. We hope it will also help to take away some of the fears and worries you may be feeling about giving yourself or someone you care about a needle.

Thousands of Canadians take one or more injections a day. Most of them report that it is much easier than they had expected. We have given you some questions to ask your doctor or diabetes educator. Ask them to fill in the spaces. This way, the information in this document is personalized for you.

What is diabetes?

Diabetes is a disease in which your body cannot properly store and use fuel for energy. The fuel that your body needs is called glucose, a form of sugar. Glucose comes from foods such as breads, cereals, pasta, rice, potatoes, fruits and some vegetables. To use glucose, your body needs insulin. Insulin is made by a gland in your body called the pancreas. There are three types of diabetes: type 1, type 2 and gestational diabetes. Gestational diabetes only occurs during pregnancy.

Is diabetes serious?

Yes. Diabetes is a life-long condition. High blood glucose levels over a long period of time can cause blindness, heart disease, kidney problems, amputations, nerve damage, and erectile dysfunction. Good diabetes care and management can delay or prevent the onset of these complications.

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The good news

You can live a long and healthy life by keeping your blood glucose levels in your target range. You can do this by:

- Eating healthy meals
- Being physically active regularly
- Taking diabetes medication, including insulin

How do I find out which type of diabetes I have?

Your doctor will tell you what type of diabetes you have and what you need to do. You can also ask your doctor to refer you to a Diabetes Education program. There, trained health professionals can teach you about diabetes and insulin.

If I have type 1 diabetes, what do I need to know?

Type 1 diabetes occurs when the body makes little or no insulin. It used to be called insulin-dependent or juvenile diabetes.

What causes type 1 diabetes?

No one really knows what causes type 1 diabetes.

We do know that:

- There is nothing you could have done to prevent type 1 diabetes, even if you had been to see the doctor sooner.
- The body's defence system may attack your insulin-making cells by mistake, but we don't know why.
- People usually find out they have type 1 diabetes before the age of 30, most often in childhood or during their teens.
- It is not caused by eating too much sugar.

If I have type 2 diabetes, what do I need to know?

Type 2 diabetes occurs when your body can't use the insulin it makes. If you have type 2 diabetes, you may be able to keep your blood glucose levels in a target range through healthy eating, physical activity and by taking diabetes medication.

Over time this may not be enough to keep blood glucose levels in a target range since type 2 diabetes is a progressive condition. Some people with type 2 diabetes need to use insulin to achieve good blood glucose control.

You may have mixed feelings about taking insulin

You may feel guilty or feel like you have failed because you must now take insulin and you may also be feeling nervous at the thought of having to take insulin injections every day. Please don't!

A number of factors may have contributed to you needing to take insulin. For example, your body may have lost its ability to make insulin and your medication may no longer work for you.

What you can do to feel better

- Share your feelings with your family and friends. Tell them what you need from them to help you manage your diabetes well.
- Just because you have diabetes does not mean that you have to stop doing the things that you and your family enjoy.
- Learn as much as you can about your diabetes. The more you learn, the less fear you will have. Even if you have had diabetes for years, attend a Diabetes Education program.

For more information about diabetes care and management, ask your healthcare team or visit our website at www.diabetes.ca.

Things you should know about insulin

When insulin was first discovered and made available for people with diabetes, there was only one kind of short-acting insulin. This required several injections a day. As time went on, new insulins were developed that lasted longer, requiring fewer injections, but requiring strict attention to timing of meals.

Now, there are different types of insulin available, made from different sources. This gives more flexibility in the number and timing of injections, making it easier to maintain target blood glucose levels, based on your lifestyle. One to four injections a day may be suggested to you for optimal control of your blood glucose. Ask your healthcare team about the best insulin plan to meet your needs. The following are general guidelines only.

Get the support you need

It is not unusual to feel scared, shocked, overwhelmed and even angry when you first hear that you have diabetes. You may also be feeling nervous at the thought of having to take insulin injections every day.

A positive and realistic attitude towards your diabetes can help you to maintain good blood glucose levels.

The following pages will help you every step of the way.

Talk to others who have diabetes – ask your local Canadian Diabetes Association branch about joining a peer-support group or visiting an information session.

Your diabetes healthcare team can help

Ask your doctor about diabetes education. Your healthcare team can answer all your questions and tell you more about diabetes.

Your team may also include a:

- Nurse
- Dietitian
- Pharmacist
- Social worker
- Psychologist
- Foot care specialist
- Endocrinologist
- Ophthalmologist

Types of Insulin available in Canada

Type	Trade name	Starts to work in	Peak action	Duration
Rapid-acting analogue (clear)	Humalog® (insulin lispro) NovoRapid® (insulin aspart)	10-15 minutes	60-90 minutes	4-5 hours
Fast-acting (clear)	Humulin®-R Novolin®ge Toronto	30- 60 minutes	2- 4 hours	5-8 hours
Intermediate-acting (cloudy)	Humulin®-N Humulin®-L Novolin®ge NPH	1- 3 hours	5-8 hours	Up to 18 hours
Long acting (cloudy)	Humulin®-U	3-4 hours	8-15 hours	22-26 hours
Extended long-acting analogue	Lantus®* (insulin glargine)	90 minutes	-	24 hours
Premixed (cloudy)	Humalog® Mix25TM Humulin® (20/80, 30/70) Novolin®ge (10/90, 20/80, 30/70, 40/60, 50/50) A single vial or cartridge contains a fixed ratio of insulin (% rapid- or fast-acting to % intermediate-acting insulin)			

*Approved, but not yet available, in Canada.

Syringes, pens, injectors and pumps

Syringes, pens, jet injectors and pumps all have one thing in common – they deliver insulin. Each carries insulin through the skin and into the fatty tissue underneath so that it can be absorbed and used by the body.

Syringes

Today's syringes are smaller, have finer needles and have special coatings on the needles so injecting is as painless as possible. If you can, try several brands before you commit to one. Ask yourself the following questions:

- Does your syringe match your insulin dosage? Using a syringe that matches your dose will help you draw up your insulin more accurately. For example, if you take less than 30 units of insulin, use a 30-unit syringe.
- Do you want a short or long needle? Which is more comfortable for you? Some syringes have shorter needles; however, the depth of the injection does

affect the absorption of the insulin. This is something you will want to mention to your diabetes educator or doctor.

- Will you reuse your syringe? Insulin syringes are approved and designed to be used one time only. Discuss with your diabetes educator or doctor if you are considering reuse of syringes.

Pens and jet injectors

Insulin pens look similar to a slightly oversized writing pen. The insulin comes in 1.5 mL or 3.0 mL cartridges containing 300 units of insulin. The cartridge is inserted into the pen and remains there until all the insulin is used. A short needle is attached to the end of the pen. Many people find insulin pens convenient, accurate and those on a multi-dose regimen often prefer them to syringes. The cartridges come in many different varieties of insulins, including premixed insulins. Disposable pens are also now available and are disposed of once the insulin is finished. Ask for instructions in the use of the pen to ensure that you are injecting the correct amount of insulin.

People who are visually impaired may also prefer insulin pens as some models make a 'clicking' sound that helps to measure the required amount of insulin. Jet injectors, on the other hand, have no needles at all. These devices release a tiny stream of insulin, which is forced through the skin by pressure. Some people find that bruising occurs at the injection site. You should consult with your diabetes healthcare team before buying one of these devices.

Also, be sure that you learn how to properly use your pen or jet injector, and how to care for it and troubleshoot should something malfunction.

Pumps

Insulin pumps are fast becoming a popular choice for people who want greater flexibility or an improvement in their blood glucose control. An insulin pump is a microcomputer, about the size of a pager, that can deliver insulin in increments as small as 1/10 of a unit. A syringe reservoir is filled with regular or rapid-acting insulin and is placed inside the pump. A thin tube called an 'infusion set' is connected to the reservoir. At the end of the set is a small needle, which is inserted into fatty tissue and left there. The infusion set is changed every two to three days.

The pump is programmed to deliver a continuous infusion of background or 'basal' insulin. Whenever food is eaten the user delivers a 'bolus' or surge of insulin. For pump therapy to be safe, it is essential to check the blood glucose a minimum of four to six times per day. Carbohydrate counting and diabetes problem solving are other important components of successful pumping. To ensure safe and effective pump therapy you will require assistance and intensive education from your diabetes healthcare team.

Insulin works differently in different people depending on factors such as: injection site, amount of insulin, etc.



Are there other ways to inject insulin?

Yes. Ask your doctor or diabetes educator about the different ways to inject and what methods are best for you. Make sure that you have instructions in how to use the pens and/or other methods of injections.

How do I give insulin?

Step 1 – Getting your insulin

Insulin comes in vials or cartridges. In Canada, most insulins are available as “U100,” or 100 units of insulin in every milliliter (mL) of liquid. The short-acting and rapid-acting insulins are clear and colourless. The longer acting and premixed insulins are cloudy or milky in appearance. Always check the expiry date and the appearance of your insulin when you buy it and before you inject it.

Ask your doctor, pharmacist or diabetes nurse:

- The name(s) of the insulin(s) you use
- The amount of each insulin you should use
- At what times during the day should you inject your insulin?
- When does your insulin work the hardest?

Step 2 – Storing your insulin

- The vial of insulin you are using can be kept at room temperature for 28 days after opening.
- Keep extra unopened insulin in the refrigerator door. Once opened, it is good for 28 days or, unopened, until the expiry date.
- Make sure your insulin does not freeze or get too hot (i.e. when left in the car or in direct sunlight).

Step 3 – Preparing a single dose of insulin when taken with a syringe

Your doctor or diabetes educator may modify some of these steps to fit your needs.

- Gather supplies: insulin, syringe and alcohol swab (if desired).
- Wash your hands.
- Gently rotate the cloudy insulin to make sure the contents are uniformly cloudy or milky.
- Clean the rubber stopper with an alcohol swab (if desired).
- Remove the cover from the needle. Pull the plunger back until the tip of the plunger is at the line for the number of units you need. This allows air into the syringe.
- Push the needle through the rubber stopper. Push in the plunger to put the air into the vial. Keep the needle in the vial.
- Turn the vial and the syringe upside down. Make sure the tip of the needle is in the insulin. Pull back the plunger until it is five units past your dose.
- Look at the insulin in the syringe. There may be a small air bubble. Flick the syringe so the bubble rises to the top. Push the air and extra units back into the vial and stop at your dose.
- Double-check your dose.
- Pull the needle out of the rubber stopper.

Step 4 – Where to inject

- Insulin must be injected under the skin for it to work, but not directly into the blood.
- Insulin should be injected in the fatty part of the abdomen, upper arms, thighs or buttocks. The fastest and most consistent absorption is from the abdomen.
- Insulin is absorbed from different parts of your body at different rates and can also be affected by the amount of physical activity you are doing. Discuss a pattern for injections with your doctor or diabetes educator and mark them on the next page.

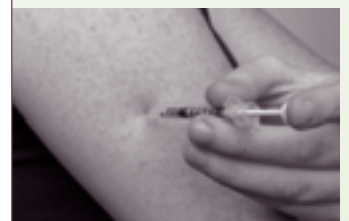
Step 5 – Giving your insulin injection

- Choose the site for your injection.
- Clean the skin with an alcohol swab (if desired).
- Pinch up a large area of skin. Push the needle into the skin going straight in (90-degree angle). When using a very short needle, 5 mm in length, there is usually no need to pinch up the skin.
- Push the plunger all the way down. Release the pinched skin.
- Pull the needle out. If insulin leaks out of the skin after removing the needle, try waiting for five to ten seconds before removing the needle next time. Do not worry if a small drop of blood appears at the site.
- Dispose of the needle in a puncture-proof container (e.g. syringe disposal system or an opaque bleach container). Discuss with members of your local trash disposal authorities the options for disposing of this container in your community.
- If you are overweight and find that your blood glucose levels rise when you use short needles, talk to your doctor about other needles that will give better insulin absorption.

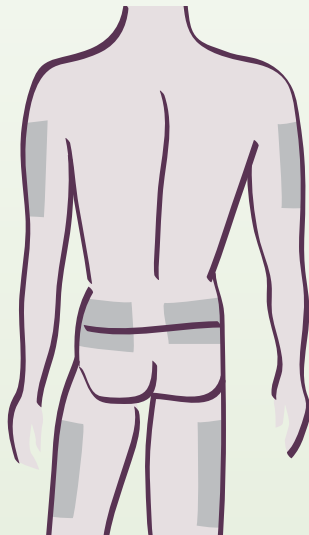
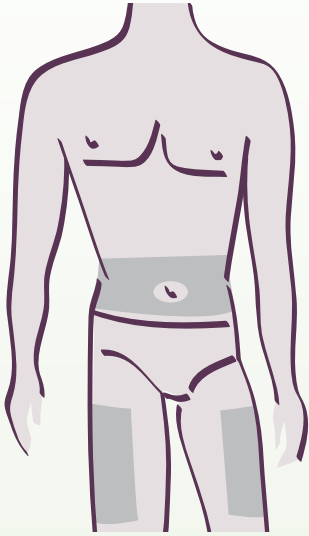
What if I need two different kinds of insulin?

Some insulins come already mixed. In this case, just follow step 3 in the previous section. If you need to mix the insulins yourself, review the following:

- My clear (rapid or short-acting) insulin is called: _____
My dose of clear insulin (a): _____ units
- My cloudy insulin is called: _____
My dose of cloudy insulin (b): _____ units
- Add (a) + (b) together = _____ units
- Clean the tops of the vials with an alcohol swab (if desired).
- Draw back the plunger of the syringe to the number of (b) units you need. Put the syringe into the cloudy vial and press the plunger down. This injects air into the vial. Remove the needle from the vial without taking insulin out.
- Repeat using the (a) units for the clear insulin. Leave the syringe in the vial.



Insulin injection sites



- Turn the vial and the syringe upside down. Hold the vial with one hand and the syringe with the other. Pull back the plunger to five units past the your dose.
- If you get an air bubble, flick the syringe so the bubble rises to the top. Then push the air back into the vial. Adjust insulin to the correct dose. Remove the needle from the clear insulin vial.
- Gently rotate the cloudy insulin vial to mix the insulin.
- Put the needle with the clear insulin into the cloudy vial, and turn upside down as before.
- Pull back the plunger until you have the total number of units required (a) + (b) units. Do not go past the total dose.
- Make sure you do not push any of the clear insulin into the cloudy vials. If you pull up too much of the cloudy insulin into the syringe, throw it out and start again. Do not put the insulin back into the vial (never use the clear insulin if it has become cloudy).
- Remove the needle from the cloudy vial and inject as stated in Step 5 in the previous section.

What do I need to know about blood glucose levels?

How do I test my blood glucose levels?

A blood glucose meter is used to test your blood glucose at home. Meters can be purchased at most pharmacies. Talk with your diabetes educator or pharmacist about which model is right for you. When you decide, make sure you receive the proper training before you go home.

Ask your diabetes educator about:

- The size of the drop of blood needed
- The type of blood glucose strips to use
- How to clean the meter
- How to check if the meter is accurate
- How to code your meter

Note: Your province or territory may subsidize the cost of blood glucose monitoring supplies. Contact your local Canadian Diabetes Association branch to find out if this applies to you.

Checking your blood glucose levels will:

- Give you a quick measurement of your blood glucose level at ‘that’ time.
- Tell you if you have a high or low blood glucose level at ‘that’ time.
- Show you how your lifestyle and insulin are affecting your blood glucose levels.
- Help you and your diabetes healthcare team to make changes to your lifestyle and insulin dosage that will improve your blood glucose levels.

Recommended Blood Glucose Targets for People With Diabetes*

	A1C	Fasting blood glucose/blood glucose before meals (mmol/L)	Blood glucose two hours after eating (mmol/L)
Target for most patients with diabetes	A7.0%	4.0 to 7.0	5.0 to 10.0
Normal range	A6.0%	4.0 to 6.0	5.0 to 8.0

*This information is only a guide. Talk to your doctor about YOUR blood glucose target ranges.

Low blood glucose

What causes a low blood glucose level (hypoglycemia)?

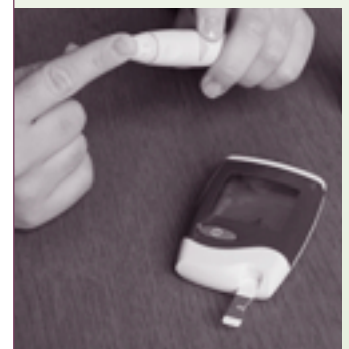
Low blood glucose may be caused by:

- More physical activity than usual
- Not eating on time
- Eating less than you should have
- Taking too much medication
- The effects of drinking alcohol

Low blood glucose can happen quickly, so it is important to take care of it right away.

How do I keep my blood glucose levels in my target range?

If you have diabetes, you should try to keep your blood glucose as close to target range as possible. This will help to delay or prevent complications. Maintaining healthy eating habits, an active lifestyle and taking insulin, will help you stay in your target range.



What is low blood glucose?

When the amount of blood glucose has dropped below 4 mmol/L, it is called low blood glucose or hypoglycemia.

What are the signs of a low blood glucose level?

You may feel:

- Shaky, light-headed
- Nervous, irritable
- Confused
- Hungry
- Your heart rate is faster
- Sweaty, headachy
- Weak
- A numbness or tingling in your tongue or lips

If your blood glucose drops very low you may:

- Become confused and disoriented
- Lose consciousness
- Have a seizure

You will need assistance from another person. Make sure you always wear your MedicAlert® identification, and talk to your doctor or diabetes educator about prevention and emergency treatment for severe low blood glucose.

How do I treat a low blood glucose?

If you are experiencing the signs of a low blood glucose, check your blood glucose immediately. If you don't have your meter with you, treat the symptoms anyway. It is better to be safe.

Eat or drink a fast-acting carbohydrate (15 grams):

- 15 g of glucose in the form of glucose tablets
- 15 mL (3 teaspoons) or 3 packets of table sugar dissolved in water
- 175 mL (3/4 cup) of juice or regular soft drink
- 6 Life Savers® (1=2.5 g of carbohydrate)
- 15 mL (1 tablespoon) of honey

Wait 10 to 15 minutes, then check your blood glucose again. If it is still low:

- Treat again
- If your next meal is more than one hour away, or you are going to be active, eat a snack, such as a half-sandwich or cheese and crackers (something with 15 grams of carbohydrate and a protein source.)

High blood glucose

What causes high blood glucose (hyperglycemia)?

High blood glucose can result when food, activity and insulin are not balanced. High blood glucose may happen when you are sick or under stress.

What do I do if I have high blood glucose?

If you have type 1 diabetes, it is important that you test your urine for ketones.

You should also call or see your doctor. You may need to:

- Adjust your medication and/or insulin
- Adjust your meal plan
- Increase your physical activity

What lifestyle changes should I make?

Eat healthy

- Eat three meals and a bedtime snack each day.
- Include a food from each of the food groups at each meal.
- If you are thirsty, drink water or diet pop.
- If you are overweight, eat smaller portions. Reduce your intake of fat.
- Limit sweet and fatty foods.

Keep active

- Talk to your diabetes healthcare team to learn how to adjust your insulin and food to prevent low blood glucose levels while exercising.
- Carry some form of sugar with you and extra food.
- Carry your meter with you. Be prepared to stop and test during exercise if you feel any symptoms.
- Wear a MedicAlert® identification.
- Carry a record of the names and amounts of insulin you use and any other medications that you use regularly.
- Wear comfortable shoes and socks.
- Test your blood glucose before exercising. If lower than _____ mmol/L, (have your doctor fill out) you may need extra food before you start.
- Stop exercising if you have pain or feel tired.
- Enjoy yourself.

To learn more about positive lifestyle changes that will help you to manage your diabetes well, ask your healthcare team or visit our website at www.diabetes.ca.

What is high blood glucose?

When the amount of blood glucose rises above 11 mmol/L, it is called high blood glucose or hyperglycemia.

What are the signs of high blood glucose?

You may:

- Be thirsty
- Urinate more often
- Be tired

Know who to turn to

The Canadian Diabetes Association promotes the health of Canadians through diabetes research, education, service and advocacy.

Canadians can turn to the Canadian Diabetes Association for answers and help in accessing diabetes resources across the country.

With a presence in over 150 communities, the Canadian Diabetes Association's strong network of assistance includes volunteers, employees, healthcare professionals and partners.

Don't forget

Be prepared

If you experience severe low blood glucose, you will need help. Talk to your doctor or diabetes educator about prevention and emergency treatment, and tell your family, friends and co-workers how they can help.

Always wear your MedicAlert® identification.

Report your diabetes to the motor vehicle licensing office

In most provinces and territories a licensed driver who has diabetes must report their condition immediately to the motor vehicle licensing office.

Be aware of the changes to your insurance

People with diabetes may find it more difficult to obtain or renew insurance of all types: vehicle, mortgage, life and travel.

The Canadian Diabetes Association offers its members the opportunity to purchase both travel insurance, which covers all diabetes-related emergency expenses and credit life insurance.

Be aware of your workplace rights

There is no evidence that people who have diabetes are a greater safety risk at work than people who do not have diabetes. You should not need more time away from work due to illness than other employees. If you think that you are not being treated fairly in your workplace, contact your local Canadian Diabetes Association branch.

Talk to us about

- Becoming a member, volunteering or making a donation
- Access to travel and Credit Life Insurance for people with diabetes
- Joining a local peer-support group
- Obtaining the most up-to-date information on diabetes

Canadian Diabetes Association

1-800-BANTING (226-8464)

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Know who to turn to



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