

## Diabetes Centre Calgary - Type 1 Diabetes Review

Diabetes Centre Calgary educators strive to ensure each pump candidate is well prepared for advanced diabetes management prior to starting or continuing on an insulin pump. As part of our program's criteria for provincial approval, you, along with your diabetes educator, are required to review standard type 1 diabetes education. The handouts included in this package will help guide your discussion. Many of these handouts and other resources can be found on the Diabetes Canada website- [www.diabetes.ca](http://www.diabetes.ca) or their resource page <http://guidelines.diabetes.ca/patient-resources> . You may also access links to Alberta Health Services handouts on our website [endometab.ca](http://endometab.ca) (full URL for handouts is <https://cumming.ucalgary.ca/resources/endocrinology-metabolism/patients-and-family/diabetes-patients/resources> ).

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# Type 1 diabetes: the basics



## What is type 1 diabetes?

Type 1 diabetes is a disease in which the pancreas does not produce any insulin. Insulin is a hormone that helps your body to control the level of sugar (glucose) in your blood. Without insulin, sugar builds up in your blood instead of being used for energy. Your body produces sugar and also gets sugar from foods like bread, potatoes, rice, pasta, milk and fruit.

**The cause of type 1 diabetes remains unknown. It is not caused by eating too much sugar, and is not preventable. The current thought is that type 1 diabetes occurs when the body's immune system destroys the cells that make insulin.**

## Insulin therapy

Insulin therapy is required for the treatment of type 1 diabetes. There are a variety of insulins available to help manage diabetes. Insulin is injected by pen, syringe or pump. Your doctor will work with you to determine:

- The number of insulin injections you need per day
- The timing of your insulin injections
- The dose of insulin you need with each injection

The insulin treatment your doctor prescribes will depend on your goals, age, lifestyle, meal plan, general health and motivation. Social and financial factors may also need to be considered.

## The good news

You can live a long and healthy life by keeping your blood sugar levels in the target range set by you and your health-care provider:

You can do this by:

- Taking insulin as recommended (and other medications, if prescribed by your doctor)
- Monitoring your blood sugar levels regularly using a home blood glucose meter\*
- Eating healthy meals and snacks
- Enjoying regular physical activity
- Aiming for a healthy body weight
- Managing stress effectively

\*Discuss with your health-care provider how often you should measure your blood sugar level

## Get the support you need

A positive and realistic attitude toward your diabetes can help you manage it. Talk to others who have type 1 diabetes or their caregivers. Ask your local Diabetes Canada branch about additional resources, joining a peer-support group or taking part in an information session.



## Who can help you?

Your health-care team is there to help you. Depending on your needs and the resources available in your community, your team may include a family doctor, diabetes educator (nurse and/or dietitian), endocrinologist, pharmacist, social worker, exercise physiologist, psychologist, foot-care specialist, eye-care specialist. They can answer your questions about how to manage diabetes and work with you to adjust your food plan, activity and medications.

Remember, you are the most important member of your health-care team

## Complications of diabetes

Over time, high blood sugar levels can cause complications such as blindness, heart disease, kidney problems, nerve damage and erectile dysfunction. Fortunately, good diabetes care and management can prevent or delay the onset of these complications.

## You can reduce your chances of developing these complications if you:

- Keep your blood sugar within your target range\*
- Avoid smoking
- Keep your cholesterol and other blood fats within your target range\*
- Keep your blood pressure within your target range\*
- Take care of your feet
- Have regular visits with your doctor, diabetes team, dentist and eye-care specialist

\*Discuss your target ranges with your health-care provider

**Related articles:** *Managing your blood sugar, Physical activity and diabetes, Just the basics (tips for healthy eating), Cholesterol and diabetes, High blood pressure and diabetes, Smoking and diabetes, Foot care: a step toward good health, and Staying healthy with diabetes*

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Diabetes Canada is making the invisible epidemic of diabetes visible and urgent. Eleven million Canadians have diabetes or prediabetes. Now is the time to End Diabetes - its health impacts as well as the blame, shame and misinformation associated with it. Diabetes Canada partners with Canadians to End Diabetes through education and support services, resources for health-care professionals, advocacy to governments, schools and workplaces, and, funding research to improve treatments and find a cure.

## What is blood glucose (sugar)?

Blood glucose (sugar) is the amount of glucose in your blood at a given time.

## Why should you check your blood sugar levels?

Checking your blood sugar levels will:

- provide a quick measurement of your blood sugar level at a given time;
- determine if you have a high or low blood sugar level at a given time;
- show you how your lifestyle and medication affect your blood sugar levels; and
- help you and your diabetes health-care team to make lifestyle and medication changes that will improve your blood sugar levels.

## How often should you check your blood sugar levels?

How frequently you check your blood sugar levels should be decided according to your own treatment plan. You and your health-care provider can discuss when and how often you should check your blood sugar levels. Checking your blood sugar levels is also called Self-Monitoring of Blood Glucose (SMBG).

## How do you test your blood sugar levels at home?

A *blood glucose meter* is a device used to check your blood sugar at home. You can get these meters at most pharmacies or from your diabetes educator. Talk with your diabetes educator or pharmacist about which one is right for you. Once you receive a meter, ensure you receive the proper training before you begin to use it.

Ask your health-care provider about:

- how and where to draw blood
- how to use and dispose of lancets (the device that punctures your skin)
- 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 (*if needed*)

A *flash glucose meter* (FGM) is a new generation device that uses sensor scans for blood sugar monitoring and doesn't require finger pricks.

A *continuous glucose monitor* (CGM) is a device that checks blood sugar level by a sensor inserted under your skin.

## How do you keep your blood sugar levels within their target range?

If you have diabetes, you should try to keep your blood sugar as close to target range as possible. This will help to delay or prevent complications of diabetes. Maintaining healthy eating habits and an active lifestyle, and taking medication, if necessary, will help you keep your blood sugar levels within their target range. Target ranges for blood sugar can vary. It depends on a person's age, medical condition and other risk factors.

Targets for pregnant women, older adults and children 12 years of age and under are different. Ask your health-care provider what your levels should be.

## Managing your blood sugar when you're ill

When you are sick, your blood sugar levels may fluctuate and be unpredictable. During these times, it is a good idea to check your blood sugar levels more often than usual (for example, every two to four hours). It is also very important that you continue to take your diabetes medication. If you have a cold or flu and are considering using a cold remedy or cough syrup, ask your pharmacist to help you make a good choice. Many cold remedies and cough syrups contain sugar, so try to pick sugar-free products.

### When you are sick, it is **VERY IMPORTANT** that you:

- drink plenty of extra sugar-free fluids or water; try to avoid coffee, tea and colas, as they contain caffeine, which may cause you to lose more fluids.
- replace solid food with fluids that contain sugar if you can't eat according to your usual meal plan;
- try to consume 15 grams of carbohydrate every hour if you are not able to follow your usual meal plan;
- call your doctor or go to an emergency room if you vomit and/or have had diarrhea two times or more in four hours; and
- if you are on insulin, be sure to continue taking it while you are sick. Check with your health-care team about guidelines for insulin adjustment or medication changes during an illness.

## Recommended blood sugar targets for most people with diabetes\*

Your target may not be the same as the examples in this blood sugar levels chart. Yours should be specific to you.

	A1C**	Fasting blood glucose (sugar) / blood sugar before meals (mmol/L)	Blood sugar two hours after eating (mmol/L)
Target for most people with diabetes	7.0% or less	4.0 to 7.0	5.0 to 10.0 (5.0 – 8.0 if A1C** targets not being met)

\* This information is based on the Diabetes Canada 2018 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada and is a guide.

\*\* A1C is a measurement of your average blood sugar control for the last 2 – 3 months and approximately 50% of the value comes from the last 30 days.

## Talk to your health-care provider about YOUR blood sugar target ranges.

You should have your A1C measured every 3 months, when your blood sugar targets are not being met or when you are making changes to your diabetes management.

A1C, before meal and after meal blood sugar levels are all important measurements of your diabetes control.

**Related article:** *Lows and highs: blood sugar levels*

[Interactive Self-monitoring of Blood Glucose Tool and Sick-day Management](#)

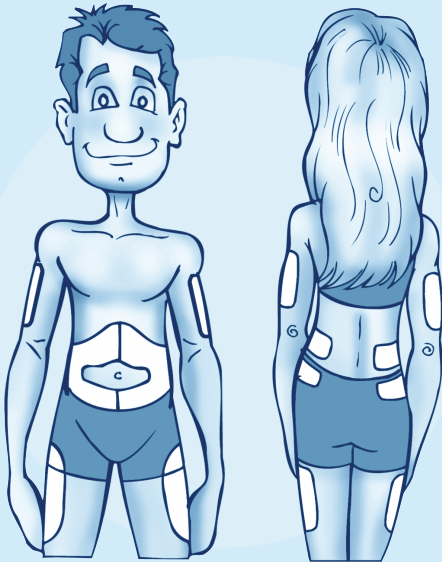
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## Insulin Injection Sites



**NOTE:** It is really important to change (rotate) where you give yourself insulin to prevent fatty lumps from forming since these can affect how your body absorbs insulin. For example, you can move from one side of your abdomen to the other side, and you can also move your injection site to a different location within each side of your abdomen.

Avoid a 2-inch area around the belly button as well as scar tissue.

### Insulin Pens:

Your pen comes with an instruction book. Please review it to understand how your pen works, how to load the cartridge, and how to prepare your pen for an insulin injection. There are different sizes and lengths of needle tips available. Most often the shortest needle is recommended. Talk with your health-care professional about which needle tip would be best for you.

### Mixing Insulin:

Insulin that is cloudy (NPH, premixed) needs to be mixed before using. The pen should be rolled ten times, tipped ten times, and checked for a milky-white consistency.

### Check Insulin Flow (Prime):

Attach pen needle. Dial up 2 or 3 units (whichever the manufacturers recommends) and, with pen tip facing upwards, push the dosing button. If no stream of insulin appears, repeat this step again.

### Giving Your Injection:

After you have checked the insulin flow, dial up the dose of insulin to be taken. Insert pen tip into skin at a 90° angle. Push the dosing button until you see '0'. Count 10 seconds before removing the needle from your skin to ensure you receive the full dose. With longer needles ( $\geq 8$ mm), you may need to gently lift the skin before injection or inject on an angle.

Site	Things to think about
<b>Abdomen (tummy)</b> Stay 2 inches (5 cm) away from your belly button	Easy to reach. Insulin absorbs fast and consistently.
<b>Buttock and thigh</b>	Slower absorption rate than from abdomen and arm sites.
<b>Outer arm</b>	After abdomen, arm provides the next fastest absorption rate. This area is hard to reach when injecting yourself, so it is often not recommended.

## Insulin Types:

Type	Onset (How quickly it starts working)	Peak (When it is most effective)	Duration (How long it works)	Timing of injection (When should it be given)
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### Bolus insulins

<b>Rapid acting analogues</b> <ul style="list-style-type: none"> <li>• Apidra / Humalog (U100, U200) / NovoRapid</li> <li>• Fiasp</li> </ul>	10 – 15 min  4 min	1 – 2 hours  30 min – 1.5 hours	3 – 5 hours  3 – 5 hours	Given with one or more meals per day. Should be injected 0 – 15 minutes before or after meals. Fiasp is to be given two minutes before the start of your meal or within 20 minutes after.
<b>Short-acting</b> <ul style="list-style-type: none"> <li>• Entuzity U500</li> <li>• Humulin-R / Novolin ge Toronto</li> </ul>	15 min 30 min	4 – 8 hours 2 – 3 hours	17 – 24 hours 6.5 hours	

### Basal insulins

<b>Intermediate-acting</b> <ul style="list-style-type: none"> <li>• Humulin-N / Novolin ge NPH</li> </ul>	1 – 3 hours	5 – 8 hours	up to 18 hours	Often started once daily at bedtime. May be given once or twice daily. Not given at any time specific to meals.
<b>Long-acting analogues</b> <ul style="list-style-type: none"> <li>• Basaglar / Lantus U100</li> <li>• Levemir</li> <li>• Toujeo U300</li> <li>• Tresiba U100, U200</li> </ul>	90 min	not applicable	up to 24 hours 16 – 24 hours > 30 hours 42 hours	Often started once daily at bedtime. Insulin detemir (Levemir) may be given once or twice daily. Not given at any time specific to meals.

### Premixed insulins

<b>Premixed regular insulin</b> <ul style="list-style-type: none"> <li>• Humulin 30/70</li> <li>• Novolin ge 30/70, 40/60, 50/50</li> </ul>	The onset, peak, and duration of premixed insulins depend on the amounts of rapid-acting or short-acting insulin and intermediate-acting insulin. See above for more information based on the specific insulins contained in the premixed insulin.		Given with one or more meals per day. Should be injected 30 – 45 minutes before the start of the meal.	
<b>Premixed insulin analogues</b> <ul style="list-style-type: none"> <li>• Humalog Mix 25, Mix 50 / NovoMix 30</li> </ul>			Given with one or more meals per day. Should be injected 0 – 15 minutes before or after meals.	

## Insulin Care and Storage:

Unopened insulin should be stored in the fridge between 2°C and 8°C. The insulin you are using can be stored at room temperature for up to 1 month. Both Levemir and Toujeo are the exception; they are safe at room temperature for 42 days. Discard insulin that has been frozen, exposed to temperatures greater than 30°C, or expired.

## Diabetes Identification:

You should always wear identification, such as a bracelet or necklace, to identify that you have diabetes. Identification bracelets, such as MedicAlert®, can be purchased at pharmacies and jewellery stores. Always carry identification in your wallet or purse that provides information about your diabetes.

## Low Blood Sugar (Hypoglycemia):

### Treatment of Low Blood Sugar (Hypoglycemia)

#### What is low blood sugar?

When the amount of sugar in your blood (blood glucose) has dropped below your target range (i.e. is generally less than 4.0 mmol/L), a condition called low blood sugar or hypoglycemia occurs.

#### When this happens, you may feel:

- Shaky, light-headed, nauseated
- Nervous, irritable, anxious
- Weak, drowsy, vision changes
- A faster heart rate
- Sweaty, headachy
- Hungry
- Confused, difficulty concentrating or speaking
- A numbness or tingling in your tongue or lips

#### How do I treat low blood sugar?

If you are experiencing the signs of a low blood sugar level, check your blood sugar immediately. If you do not have your meter with you, treat the symptoms anyway. It is better to be safe.

Eat or drink a fast-acting carbohydrate source (containing 15 grams). For example:

- 15 g of glucose in the form of glucose tablets (preferred choice)
- 15 mL (1 tablespoon) or 3 packets of table sugar dissolved in water
- 5 cubes of sugar
- 150 mL (2/3 cup) of juice or regular soft drink
- 6 LifeSavers® (1 = 2.5 g of carbohydrate)
- 15 mL (1 tablespoon) of honey (do not use for children less than 1 year)

Low blood sugar can happen quickly, so it is important to treat it right away. If your blood sugar drops very low, you may need help from another person.

#### Causes of low blood sugar:

- More physical activity than usual
- Not eating on time
- Drinking alcohol
- Eating less than usual
- Taking too much medication

If you are planning on fasting, consult your diabetes health-care team well in advance.

## Checking Blood Sugars and Adjustment of Insulin:

Insulin: \_\_\_\_\_ Starting Dose: \_\_\_\_\_ units at \_\_\_\_\_

Blood sugar goals: \_\_\_\_\_

Contact for help with insulin adjustments: \_\_\_\_\_

What to do with your diabetes pills: \_\_\_\_\_

### Please check blood sugar using the following schedule.

	Breakfast		Lunch		Supper		Bedtime	Night
	before	after	before	after	before	after		
Insulin								
Blood sugar								



## Proper Use of Pen Tips (needles):

Use pen tips only once; they are thin and can become bent or broken if re-used. Reusing pen tips can make the injection more painful. Leaving pen tips on the cartridge may cause leaking or allow air into the cartridge which may affect the concentration of the insulin.

## Safe Sharps Disposal:

Pen tips and lancets should be disposed of in a sharps container. Check with your local pharmacy. Many pharmacies supply safe, puncture-proof containers. When the container is full, it is returned to the pharmacy in exchange for a new container. Sharps otherwise should be disposed of in accordance with local regulations.

## Diabetes Driving Guidelines

### Prevention of low blood sugar for all insulin-treated drivers

- Measure your blood sugar level immediately before and at least every 4 hours during long drives.
- Always carry blood sugar monitoring equipment and an emergency supply of fast-acting carbohydrate within easy reach (e.g. attached to the visor).
- Do not start driving if your blood sugar is less than 4.0 mmol/L. If you feel symptoms of low blood sugar while you are driving, stop the vehicle in a safe location and remove the keys from the ignition.
- If your blood sugar is less than 4.0 mmol/L, you should have 15 grams of carbohydrate and not begin to drive until your blood sugar is at least 5.0 mmol/L. It is suggested to wait for 40 minutes to recover fully from low blood sugar.
- If your blood glucose is < 2.8 mmol/L while driving you must refrain from driving immediately, and notify a member of your health-care team as soon as possible.

**Related articles:** *Lows and highs: blood sugar levels, Thinking of starting insulin, Managing your blood sugar*

Interactive Self-monitoring of Blood Glucose Tool

See Diabetes Canada on YouTube for videos about using insulin.

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## Professional Drivers

- You should follow the above recommendations as well as perform any diabetes self care as required by your licensing province.

Each province has its own rules regarding sugar control and being able to drive.

### I want to apply for a commercial licence.

#### Can I drive in Canada? In the United States?

Canadians with diabetes who are using insulin can apply for a commercial licence. Motor vehicle licensing authorities require a greater level of medical fitness for drivers operating passenger vehicles (buses/commercial vans), trucks, and emergency vehicles. Commercial drivers spend more time driving and are often under more adverse conditions than private drivers.

Canadians with diabetes who are using insulin can be licensed to drive a commercial vehicle in Canada. The Canada/US Medical Reciprocity Agreement (effective March 1999) recognizes the similarity between Canadian and American medical standards and provides for reciprocal arrangements on medical fitness requirements for Canadian and American drivers of commercial vehicles.

However, Canadian commercial drivers who have diabetes requiring insulin, are not permitted to drive in the United States.

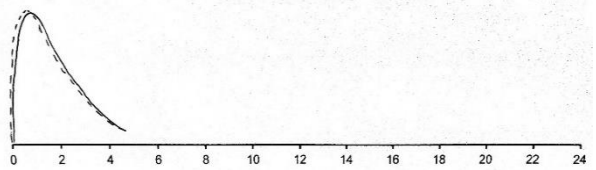
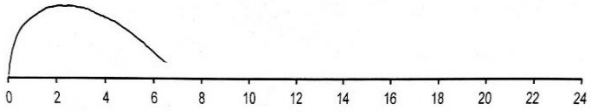
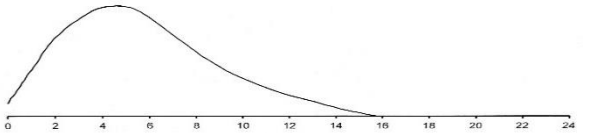
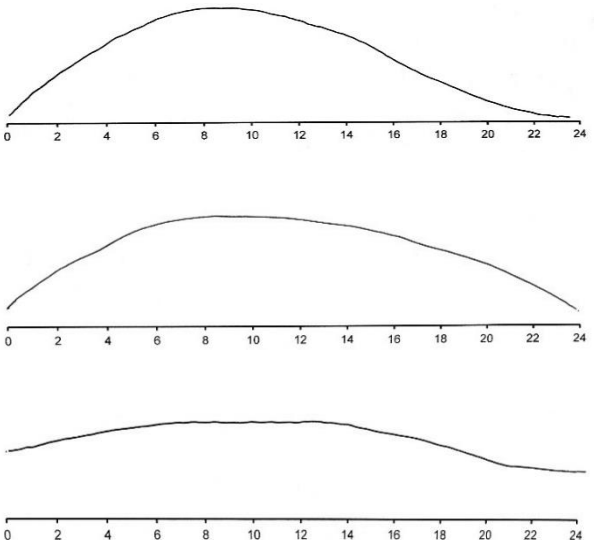
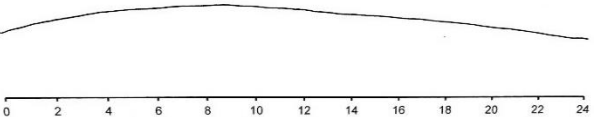
### What is Diabetes Canada's position on diabetes and driving and licensing?

Diabetes Canada believes people with diabetes should be assessed for a driver's licence on an individual basis.

For more information, see <http://www.diabetes.ca/about-cda/public-policy-position-statements/driving-licensing>.

# Average Insulin Action Time

When calculating a correction dose of insulin, please consider the action times of the insulins you are using and consider correcting to 10 mmol/L if only 2 hours after eating.

Insulin	Average insulin action
<p><b>Rapid-acting</b>            Onset 10 to 20 min, Peak 1 to 3 h, Duration 3 to 5 h</p> <ul style="list-style-type: none"> <li>• Admelog<sup>®</sup>, Humalog<sup>®</sup></li> <li>• Apidra<sup>®</sup></li> <li>• NovoRapid<sup>®</sup></li> </ul> <p>Onset 5 to 15 min, Peak 1 to 3 h, Duration 3 to 5 h</p> <ul style="list-style-type: none"> <li>• Fiasp<sup>®</sup> - dashed line</li> </ul>	
<p><b>Short-acting</b>            Onset 30 to 60 min, Peak 2 to 4 h, Duration 6 to 8 h</p> <ul style="list-style-type: none"> <li>• Humulin R<sup>®</sup></li> <li>• Novolin Toronto<sup>®</sup></li> </ul>	
<p><b>Intermediate-acting (cloudy)</b>            Onset 1 to 2 h, Peak 5 to 8 h, Duration 14 to 18 h</p> <ul style="list-style-type: none"> <li>• Humulin N<sup>®</sup></li> <li>• Novolin NPH<sup>®</sup></li> </ul>	
<p><b>Long-acting</b>            Onset 1.5 h, No peak, Duration 16 to 24 h</p> <ul style="list-style-type: none"> <li>• Levemir<sup>®</sup></li> </ul> <p>Onset 1.5h, No peak, Duration 24 h</p> <ul style="list-style-type: none"> <li>• Lantus<sup>®</sup>, Basaglar<sup>®</sup></li> </ul> <p>No peak, Duration up to 36 h</p> <ul style="list-style-type: none"> <li>• Toujeo<sup>®</sup></li> </ul>	
<p><b>Ultra-long-acting</b>            No peak, Duration 42 h</p> <ul style="list-style-type: none"> <li>• Tresiba<sup>®</sup></li> </ul>	

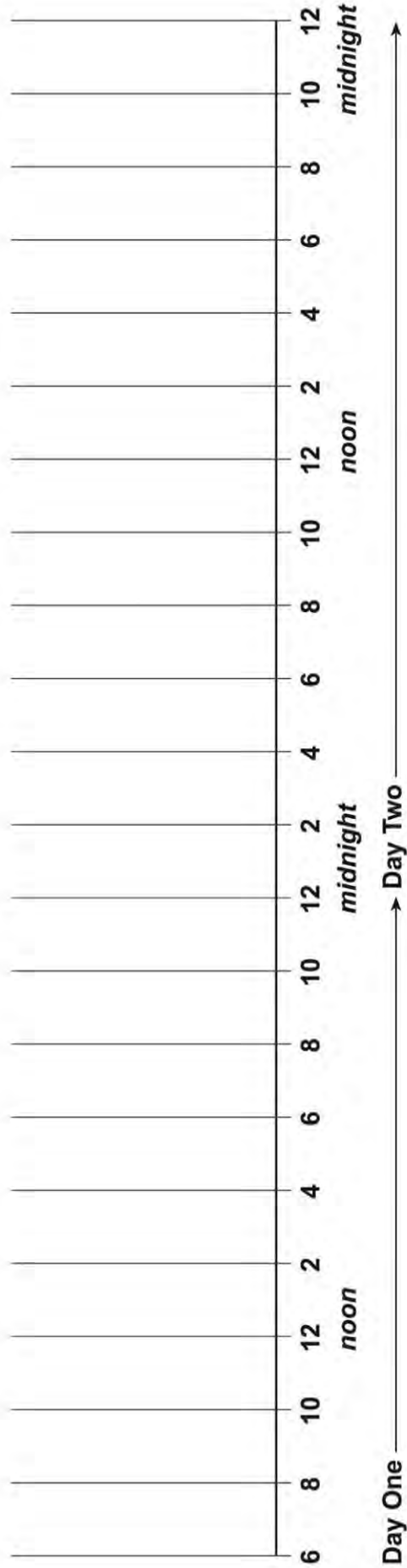
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## Your Insulin Schedule

Date \_\_\_\_\_

Goals \_\_\_\_\_ before meals

\_\_\_\_\_ after meals



Time to test your blood sugar = ↓  
Time to inject insulin = ▲

Diabetes Medicine

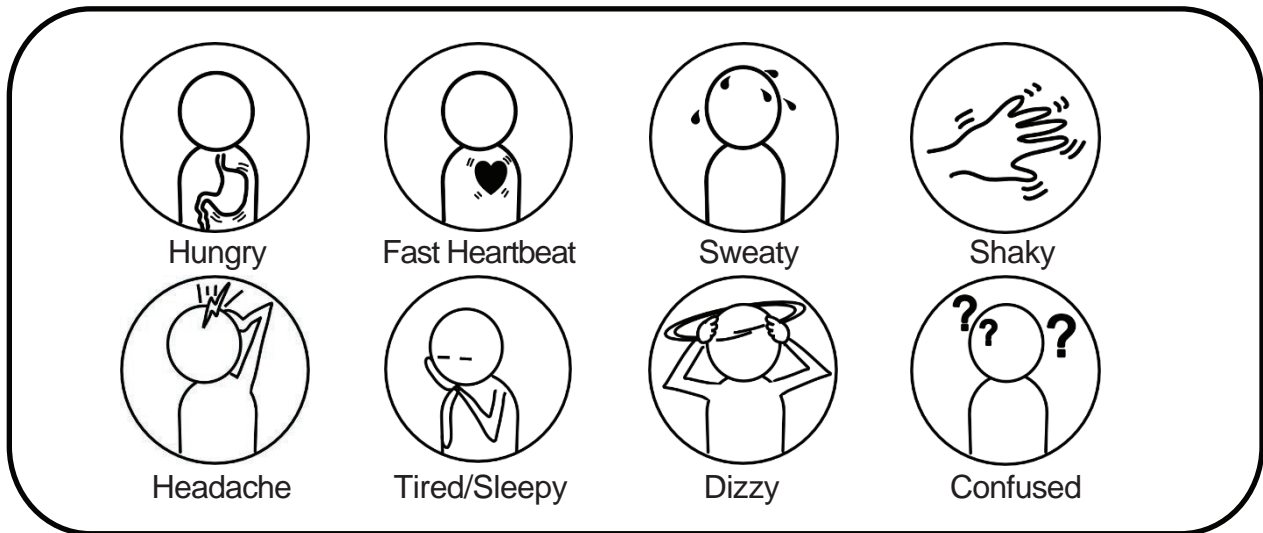
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## Low Blood Sugar (Hypoglycemia)

Low blood sugar is a reading of below **4.0 mmol/L** on a glucose meter or sensor. This can be unsafe if you're taking some diabetes medicines, especially insulin.

### Know the signs of low blood sugar



### Treat low blood sugar quickly

1. Eat 15 grams of fast-acting sugar. Examples include 1 of the following:



**Dex 4 Glucose**  
4 tablets



**Regular Pop**  
175 mL  
(3/4 cup)



**Juice**  
175 mL  
(3/4 cup)

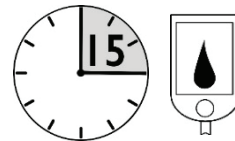


**Candies**  
3 large



**Sugar, jam,  
honey or syrup**  
15 mL (1 tsp.)

2. Wait 15 minutes. Check your blood sugar again.  
If it's below **4.0 mmol/L**, eat another 15 grams of fast-acting sugar.



3. Once your blood sugar is over **4.0 mmol/L**, eat one starchy food (7 crackers or one piece of bread) and one protein (cheese or peanut butter) if your next meal is over an hour away. Talk with your healthcare team about this step.

## Important things to know

1. If you have type 1 diabetes and can't treat a low blood sugar yourself, someone may need to give you a glucagon injection. Ask your healthcare team about this medicine.
2. If you plan to drive after treating a low blood sugar:
  - **Wait 40 minutes** before driving
  - Make sure your blood sugar is **5 mmol/L or more before you drive**
  - Know that driving skills are impaired after a low blood sugar. Ask your healthcare team for the Diabetes and Driving Handout.



## Low blood sugar is unsafe

- Low blood sugar puts you at higher risk of accidents, falls, and unclear thinking. It slows down the reaction time of your body and your mind.
- Frequent low blood sugars can lead to losing early warning signs like sweating, fast heartbeat, etc. Low blood sugars that aren't noticed and aren't treated could lead to confusion, loss of consciousness, or seizures.

## Prepare for and prevent low blood sugar

- Always carry fast-acting sugar and a glucose meter if you are at risk for low blood sugar.
- Learn how to prevent low blood sugar. Possible causes of low blood sugar are:
  - missed or late meals or snacks
  - less carbohydrate than usual
  - more physical activity than usual
  - alcohol on an empty stomach, or too much alcohol
  - too much diabetes medicine
- Talk with your healthcare team if you have low blood sugars. Your diabetes medicines might need to be adjusted.

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*AHS appreciates the assistance of the Mosaic PCN Refuge Health Clinic for translated versions.*

# Glucagon and Diabetes

## What is glucagon?

- Glucagon is a hormone that causes the liver to release stored glucose (sugar). The glucose then raises the blood sugar.
- It is used to treat severe low blood sugar.
- Glucagon must be injected.
- Glucagon begins to raise the blood sugar level within 2 to 10 minutes after it is given.

## Who would use glucagon?

- Anyone who uses insulin, especially someone with type 1 diabetes, is at risk for a severe low blood sugar and should have glucagon nearby.
- Symptoms of severe low blood sugar include:
  - confusion
  - drowsiness
  - trouble thinking and remembering
  - loss of consciousness
  - convulsions, seizures
  - not able to treat the symptoms yourself

## When is glucagon used?

- Glucagon is used when a person with diabetes is not able to swallow or take sugar by mouth to treat a low blood sugar.
- Glucagon should be injected by someone who knows how to draw up and give the injection.
- Once mixed, glucagon must be used or thrown out within 48 hours.

## How do I treat a person with diabetes who is unconscious or convulsing?

- Do not force food or liquid into the person's mouth.
1. Lay the person on his or her side in a safe place.
  2. Mix and draw up the glucagon as per the package instructions.
  3. Inject the full dose in the buttocks, thighs, or arms, like an insulin injection.
  4. Call 911 if the person does not respond in 10 minutes, you feel that you need help, or the person has severe nausea and/or vomiting and can't eat.
  5. Give the person 1 cup of juice or regular pop once awake. Wait 15 minutes and then offer a snack of starch and protein (for example, crackers and cheese).
  6. Check the person's blood sugar every hour until it is stable.

Tell your family doctor, diabetes specialist, or diabetes educators about the severe low blood sugar after the emergency is over. Insulin doses may need to be reduced after a severe low blood sugar.

### **Does glucagon have any side effects?**

- The person may have nausea, vomiting, and/or a headache (these could also be from the severe low blood sugar).

### **What else do I need to know about glucagon?**

- Family and friends should always know where the glucagon is kept. They should review how to give glucagon once in a while.
- Carry glucagon when away from home (for example, when on vacation), especially if you will not be close to a healthcare centre.
- Glucagon expires so be sure to check the expiry date. Check the expiry date before you leave the pharmacy as it should have at least 6 to 12 months before it expires.
- You do not need a prescription for glucagon. However, it costs a lot of money (\$100.00 to \$150.00). Ask your doctor for a prescription so your insurance plan can cover it.

### **How can I prevent low blood sugar?**

- Adjust your food and/or insulin when you exercise.
- Check your blood sugar in the middle of the night after an active day or evening.
- Decrease insulin doses if you see a pattern of low blood sugars.
- Alcohol affects your blood sugar. Always eat food when having alcohol and test your blood sugar before bedtime.
- Try not to miss your usual meals or snacks.
- If you have any questions or concerns, please speak to your diabetes educator or doctor.

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*This material is for information purposes only. It should not be used in place of medical advice, instruction and/or treatment. If you have questions, speak with your doctor or appropriate healthcare provider.*

## How to Manage Illness in Type 1 Diabetes and Prevent Diabetic Ketoacidosis (DKA)

- Being sick can make your blood sugar hard to control. Low blood sugar can happen if you are throwing up or not eating. Most of the time being sick will cause your blood sugar to go up. It also increases the risk of diabetic ketoacidosis (DKA).
- DKA is a life threatening condition.
- DKA happens when there is not enough insulin, which leads to a build-up of acids called ketones in the blood. People on insulin pumps are at greater risk of DKA. Ask your diabetes educator for a separate handout on pump specific DKA prevention guidelines.
- Pregnant women with type 1 diabetes are at greater risk of DKA, as they become less sensitive to insulin due to hormones produced during pregnancy. DKA during pregnancy can result in the loss of the baby.

### Steps for Preventing DKA

#### 1. Know when you are at risk for DKA:

- illness or emotional stress
- nausea, vomiting, or diarrhea
- infection
- injury or day surgery
- missing insulin dose(s)
- insulin pump/infusion malfunction
- pregnancy and type 1 diabetes
- taking an SGLT2-inhibitor or GLP-1 agonist

#### 2. Know the symptoms of DKA:

- nausea and/or vomiting
- trouble breathing
- fast heart beat
- pain in your abdomen
- “fruity” smelling breath
- lightheadedness

#### 3. Take these actions when you are at risk for DKA:

- Check your blood sugars more often and always before bed.
- Never stop your basal insulin even if you can't eat. Basal insulins include: Humulin<sup>®</sup>N, Novolin<sup>®</sup>NPH, Insulin detemir (Levemir<sup>®</sup>), glargine (Lantus<sup>®</sup> or Basaglar<sup>®</sup>), glargine 300 (Toujeo<sup>®</sup>), and degludec (Tresiba<sup>®</sup>) or the basal insulin delivered by the insulin pump.
- Use the guidelines on the other side of this page to help you correct high blood sugars and prevent DKA.
- Test for ketones at home using items you can buy at the pharmacy. These items are urine ketone strips or a glucose meter that also measures blood ketones.
- Contact your diabetes team if you need help. If your team has 24 hour phone service, phone them at \_\_\_\_\_

#### 4. Go to the emergency department for any of these reasons:

- You have ketones, you need help, and you cannot contact your diabetes team.
- You have blood ketones 3 mmol/L or greater, or you have urine ketones reading moderate to large (40 mg/dL or more, 2+ or more).
- You are throwing up and can't keep fluids down for more than 4 hours.
- You have symptoms of DKA or dehydration.



## Prevention of Diabetic Ketoacidosis (DKA) Guidelines

Test for ketones if you have type 1 diabetes and have any of these:

- blood sugar greater than 14.0 mmol/L
- symptoms of DKA **even if your blood sugar is normal** (nausea, vomiting, abdominal pain, lightheadedness, fruity smelling breath, or shortness of breath)
- illness
- symptoms of dehydration (dry mouth, dry tongue, or cracked lips)

Then follow the steps below:

Urine ketones Negative or Trace	Urine ketones Above Trace (above 5 mg/dL)
<b>Blood ketones 0.5 mmol/L or less</b>	<b>Blood ketones are 0.6 mmol/L or more*</b>
<ol style="list-style-type: none"> <li>1. Take your usual insulin correction bolus (if unsure see <b>Option 2</b>).</li> <li>2. Drink 250 ml (1 cup) of calorie free fluids every hour.</li> <li>3. Recheck blood sugar in 2 hours. If your blood sugar is:               <ul style="list-style-type: none"> <li>• less than 14 mmol/L, continue usual insulin dose</li> <li>• 14 mmol/L or more, retest ketones</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>1. Take 1.5 times the usual correction bolus by pen or syringe (if unsure see <b>Option 1 or 2</b>).</li> <li>2. Drink 250 ml (1 cup) of calorie free fluids every hour.</li> <li>3. Recheck blood sugar in 2 hours. If your blood sugar is:               <ol style="list-style-type: none"> <li>a. less than 14 mmol/L, continue usual corrections</li> <li>b. 14 mmol/L or more, retest ketones</li> </ol> </li> <li>4. If ketones are present for more than 6 hours go to emergency department.</li> <li>5. If you're on an SGLT2 inhibitor or GLP-1 agonist, stop taking it. Contact your diabetes doctor. You may need extra insulin and possibly carbohydrate.</li> </ol>
<p>* <b>3 mmol/L or greater, go to the emergency department.</b> See the first side of this handout for other times to go to the emergency department.</p>	

**Option 1:** Treating ketones if using an insulin sensitivity factor (ISF): If you use an ISF (correction factor), and you have positive ketones as described above, use one of the following formulas:

$$1.5 \times \text{Usual correction insulin dose} = \text{units to give to correct blood sugar}$$

OR

$$1.5 \times \frac{(\text{blood sugar} - \text{target blood sugar})}{\text{ISF}} = \text{units to give to correct blood sugar}$$

**Example:**

Susan's blood sugar was 19.0 mmol/L. She washed her hands and checked again. The second reading was 18.6 mmol/L. She checked for ketones, which were moderate. Her usual correction dose for this blood sugar without ketones would be 6 units.

- She gave 9 units (1.5 x 6 units) to correct the high blood sugar with ketones.
- She checked blood sugar in 2 hours. It was 18 mmol/L. Her ketones were moderate.
- She gave another correction since it had been 2 hours since her first correction. She used the same formula as above with actual blood sugar of 18 mmol/L.
- She checked again in 2 hours. Her blood sugar was 12.3 mmol/L and her ketones were trace. She did not give any more correction insulin.
- She checked again in 2 hours. Her blood sugar was 7.8 mmol/L.

**Option 2:** Treating ketones **if not** using an insulin sensitivity factor (ISF): Use this section **only** if you do not use an ISF (correction factor) **and** your healthcare provider has circled one of the following options:

1. Give extra insulin following the instructions your educator has circled below.
2. Talk with your healthcare provider to see if an ISF should be created for you.

If total daily dose of insulin is <b>less than 50</b> units		
Blood sugar level	Rapid or short-acting insulin to give if <b>no or trace ketones</b>	Rapid or short-acting insulin to give if <b>ketones are positive</b>
14 to 17	2	3
17.1 to 20	3	4
Over 20	4	6

**OR**

If total daily dose of insulin is <b>more than 50</b> units		
Blood sugar level	Rapid or short-acting insulin to give if <b>no or trace ketones</b>	Rapid or short-acting insulin to give if <b>ketones are positive</b>
14 to 16	3	4
16.1 to 18	4	6
18.1 to 20	5	7
Over 20	6	9

## More Tips if You are Sick

- If you can't manage your diabetes on your own, you need to have someone stay with you. This person should know the signs of high and low blood sugars and DKA.
- Remember **never** stop taking your insulin. You may need less insulin if your blood sugars are under 6 mmol/L and you are throwing up. Take meal insulin only if you are eating or drinking fluids with sugar.
- Replace solid foods with liquid fluids if you are feeling sick to your stomach or can't eat. If your blood sugars are under 12 mmol/L, your fluids need to have sugar in them (see List 1).

List 1: Fluids <b>with sugar</b> in them
Options to drink when you are sick and your blood sugar is <b>under 12</b> mmol/L
<ul style="list-style-type: none"><li>• fruit drink or fruit juice</li><li>• Gatorade® or other sports drinks</li><li>• regular pop</li><li>• regular powdered drinks (e.g. Kool-Aid® or Tang®)</li><li>• popsicle</li><li>• Jell-O®</li></ul>



- Drink fluids that are sugar-free if your blood sugars are over 12 mmol/L (see List 2).

List 2: Fluids <b>with no sugar</b> in them
Options to drink when you are sick and your blood sugar is <b>over 12</b> mmol/L
<ul style="list-style-type: none"><li>• water</li><li>• clear bouillon or broth</li><li>• diet pop</li><li>• sugar free Kool-Aid® or Crystal Lite®</li><li>• black coffee and tea</li><li>• diet popsicle</li><li>• diet Jell-O®</li></ul>



- Consider speaking to your doctor or pharmacist for treatment options for nausea and vomiting.

### References:

1. Abbott Precision Xtra Blood Glucose and Ketone Monitoring System User Manual. [https://www.abbottdiabetescare.com/dms/abbott-diabetes-care/document/Precision-Extra/Owners-Guide/ART21070-101\\_Rev-A\\_web.pdf](https://www.abbottdiabetescare.com/dms/abbott-diabetes-care/document/Precision-Extra/Owners-Guide/ART21070-101_Rev-A_web.pdf) Accessed 16/12/2013.
2. Correlation between urine ketones and capillary blood ketones (3 beta hydroxybutarate) in hyperglycemic patients. *Diabetes and Metabolism*. 33 (2):135-3, 2007

## Just the basics



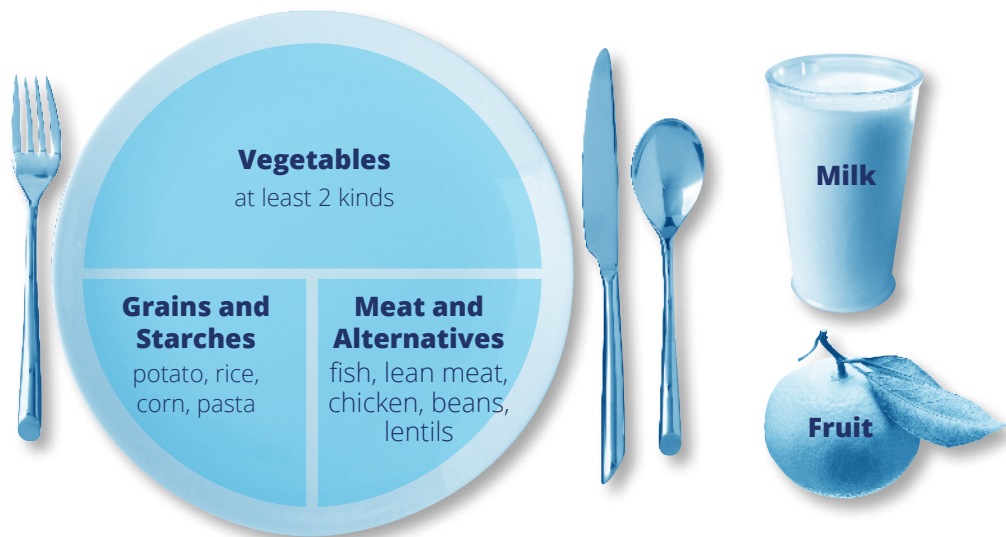
Diabetes is a condition in which your body cannot properly use and store food for energy. The fuel that your body needs is called glucose, a form of sugar. Glucose comes from foods such as fruit, milk, some vegetables, starchy foods and sugar.

To control your blood sugar (glucose) you will need to eat healthy foods, be active and you may need to take pills and/or insulin.

### Here are some tips to help you until you see a registered dietitian.

Tips:	Reasons:
Eat three meals per day at regular times and space meals no more than six hours apart. You may benefit from a healthy snack.	Eating at regular times helps your body control blood sugar levels.
Limit sugars and sweets such as regular pop, desserts, candies, jam and honey.	The more sugar you eat, the higher your blood sugar will be. Artificial sweeteners can be useful substitutes.
Limit the amount of high-fat food you eat such as fried foods, chips and pastries.	High-fat foods may cause you to gain weight. A healthy weight helps with blood sugar control and is healthier for your heart.
Eat more high-fibre foods such as whole grain breads and cereals, lentils, dried beans and peas, brown rice, vegetables and fruits.	Foods high in fibre may help you feel full and may lower blood sugar and cholesterol levels.
If you are thirsty, drink water.	Drinking regular pop and fruit juice will raise your blood sugar.
Add physical activity to your life.	Regular physical activity will improve your blood sugar control.
Limit alcohol consumption.	Alcohol can affect blood sugar levels and cause you to gain weight.

## Plan for healthy eating

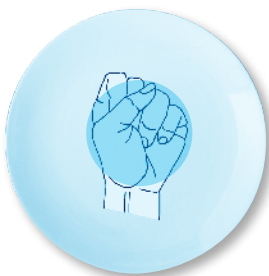


- Eat more vegetables. These are very high in nutrients and low in calories.
- Choose lean animal proteins. Select more vegetable protein.
- Select plant oils such as olive and canola, and nuts instead of animal fats.
- Include low-glycemic-index foods such as legumes, whole grains, and fruits and vegetables.
- Consider learning about counting carbohydrates, and different types of eating patterns (e.g. Mediterranean, DASH) when you see a registered dietitian.

It's natural to have questions about what food to eat. A registered dietitian can help you include your favourite foods in a personalized meal plan.

## Handy portion guide

Your hands can be very useful in estimating appropriate portions. When planning a meal, use the following portion sizes as a guide:



### Grains and starches\*/ Fruits\*

Choose an amount the size of your fist for grains or starches, or fruit.

### Milk and alternatives\*

Drink up to 1 cup (250 mL) of low-fat milk with a meal.



### Vegetables\*

Choose as much as you can hold in both hands. Choose brightly coloured vegetables (e.g., green or yellow beans, broccoli).



### Meat and alternatives\*

Choose an amount the size of the palm of your hand and the thickness of your little finger.



### Fat\*

Limit fat to an amount the size of the tip of your thumb.

\* Food group names taken from *Beyond the Basics: Meal Planning for Healthy Eating, Diabetes Prevention and Management*.  
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- Diabetes Canada recommends that all people with diabetes should receive advice on nutrition from a registered dietitian.
- Be sure to eat breakfast. It provides a good start to the day.
- Try to prepare more of your meals at home and use whole, unprocessed ingredients.
- Eat together as a family more often to model healthy eating behaviours to children and teenagers.
- If you are planning on fasting, talk to your health-care team 1 to 2 months in advance.

## Sample meal plan

### For smaller appetites

#### Breakfast:

Cold cereal (½ cup, 125 mL)  
 Whole grain toast (1 slice)  
 1 orange  
 Low-fat milk (1 cup, 250 mL)  
 Peanut butter (2 tbsp, 30 mL)  
 Tea or coffee

#### Lunch:

1 sandwich  
     2 slices of whole grain bread or 6" pita  
     meat, chicken or fish (2 oz, 60 g)  
     non-hydrogenated margarine (1 tsp, 5 mL)  
 Carrot sticks  
 Grapes (½ cup, 125 mL)  
 Low-fat plain yogurt (¾ cup, 175 mL)  
 Tea or coffee

#### Dinner:

Potato (1 medium) or rice (⅔ cup, 150 mL)  
 Vegetables  
 Non-hydrogenated margarine (1 tsp, 5 mL)  
 Lean meat, chicken, or fish (2 oz, 60 g)  
 Cantaloupe (1 cup, 250 mL)  
 Low-fat milk (1 cup, 250 mL)  
 Tea or coffee

#### Evening Snack:

Low-fat cheese (1 oz, 30 g)  
 Whole grain crackers (4)

## Increase your physical activity

- Build time for physical activity into your daily routine.
- Try to be active most days of the week.
- Walk whenever you can, instead of taking the car.
- Start slowly and gradually increase the amount of effort; for instance, progress from strolling to brisk walking.
- Make family activities active; try swimming or skating instead of watching TV or a movie.
- Try new activities; learn to dance, play basketball, or ride a bike.
- Enjoy your improved sense of health and well-being.



## Follow a healthy lifestyle

- Have at least 3 out of the 4 key food groups at each meal from *Eating Well with Canada's Food Guide*:
  - vegetables and fruit
  - grain products
  - milk and alternatives
  - meat and alternatives
- Have portion sizes that will help you reach or maintain a healthy body weight.
- Include high-fibre foods such as whole grain breads, cereals, and pastas, fresh fruits, vegetables and legumes.
- Make lower fat choices (e.g. use skim milk and lean ground beef, trim fat on meat, chicken etc., and use small amounts of added fat such as oil and salad dressings).
- Healthy eating habits should be built around a healthy lifestyle – keep active every day.

## Sample meal plan

### For bigger appetites

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#### Breakfast:

Cold cereal (½ cup, 125 mL)  
Whole grain toast (2 slices)  
1 orange  
Low-fat milk (1 cup, 250 mL)  
Low-fat cheese (2 oz, 60 g)  
Tea or coffee

#### Lunch:

Soup (1 cup, 250 mL)  
Sandwich

- 2 slices whole grain bread or 6" pita
- lean meat, chicken or fish (3 oz, 90 g)
- tomato slices
- non-hydrogenated margarine (1 tsp, 5 mL)

Carrot sticks  
Grapes (½ cup, 125 mL)  
Low-fat plain yogurt (¾ cup, 175 mL)  
Tea or coffee

#### Afternoon Snack:

1 medium apple or small banana

#### Dinner:

1 large potato or cooked noodles (1½ cup, 375 mL)  
Vegetables  
Green salad with low-fat salad dressing  
Lean meat, chicken or fish (4 oz, 120 g)  
1 medium pear  
Low-fat milk (1 cup, 250 mL)  
Tea or coffee

#### Evening Snack:

Peanut butter (4 tbsp, 60 mL)  
Whole grain crackers (4)  
Low-fat milk (1 cup, 250 mL)

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**Related articles:** *Physical activity and diabetes, Glycemic index, Eating away from home, Alcohol and diabetes, Managing weight and diabetes*

**DIABETES  
CANADA**

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Diabetes Canada is making the invisible epidemic of diabetes visible and urgent. Eleven million Canadians have diabetes or prediabetes. Now is the time to End Diabetes - its health impacts as well as the blame, shame and misinformation associated with it. Diabetes Canada partners with Canadians to End Diabetes through education and support services, resources for health-care professionals, advocacy to governments, schools and workplaces, and, funding research to improve treatments and find a cure.

## Basic carbohydrate counting for diabetes management



**Carbohydrate counting** is a flexible way to plan your meals. It focuses on foods that contain carbohydrate as these raise your blood sugar the most. Follow these steps to count carbohydrates and help manage your blood sugar levels. Your registered dietitian will guide you along the way.

### **STEP 1 Make healthy food choices**

- Enjoy a variety of vegetables, fruits, whole grains, low fat milk products, and meat and alternatives at your meals. A variety of foods will help to keep you healthy.
- Use added fats in small amounts. This helps to control your weight and blood cholesterol.
- Choose portion sizes to help you to reach or maintain a healthy weight.

### **STEP 2 Focus on carbohydrate**

- Your body breaks down carbohydrate into sugar (glucose). This raises your blood sugar levels.
- Carbohydrate is found in many foods including grains and starches, fruits, some vegetables, legumes, milk and milk alternatives, sugary foods and many prepared foods.
- Meat and alternatives, most vegetables and fats contain little carbohydrate. Moderate servings will not have a big effect on blood sugar levels.

### **STEP 3 Set carbohydrate goals**

- Your dietitian will help you set a goal for grams of carbohydrate at each meal and snack. This may be the same from day to day or may be flexible, depending on your needs.
- Aim to meet your target within 5 grams per meal or snack.

### **STEP 4 Determine carbohydrate content**

- Write down what you eat and drink throughout the day.
- Be sure to note the portion sizes. You may need to use measuring cups and food scales to be accurate.
- Record the grams of carbohydrate in these foods and drinks.
- For carbohydrate content of foods, check the *Beyond the Basics* resources, food packages, food composition books, restaurant fact sheets and websites.

### **STEP 5 Monitor effect on blood sugar level**

- Work with your health-care team to correct blood sugar levels that are too high or too low.



Nutrition Facts	
Per 90 g serving (2 slices)	
Amount	% Daily Value
<b>Calories</b> 170	
<b>Fat</b> 2.7 g	4 %
Saturated 0.5 g + Trans 0 g	5 %
<b>Cholesterol</b> 0 mg	
<b>Sodium</b> 200 mg	8 %
<b>Carbohydrate</b> 36 g	13 %
Fibre 6 g	24 %
Sugars 3 g	
<b>Protein</b> 8 g	
Vitamin A 1 %	Vitamin C 0 %
Calcium 2 %	Iron 16 %

## Finding carbohydrate values using the Nutrition Facts table

The amount of carbohydrate in a food is listed on the Nutrition Facts table.

- The amount listed is for the serving size given. Are you eating more, less, or the same amount? Compare your serving size to figure out the amount of carbohydrate you are eating.
- The total amount of carbohydrate in grams is listed first. This number includes starch, sugars and fibre. (Starch is not listed separately.)
- Fibre does not raise blood sugar and should be subtracted from the total carbohydrate (i.e. 36 g carbohydrate – 6 g fibre = 30 g available carbohydrate).

## Let's carb count! Sample carbohydrate counting

Food	Portion size	Grams of carbohydrate	Carbohydrate choices
<b>Example – sandwich lunch</b>			
Bread, whole wheat*	2 slices	30 g	2
Chicken breast	2 oz/60 g	0	0
Margarine	1 tsp/5 mL	0	0
Carrot sticks	½ cup/125 mL	0	0
Green grapes*	½ cup/125 mL	15 g	1
Milk*	1 cup/250 mL	15 g	1
Tea/coffee	1 cup/250 mL	0	0
	TOTAL	60 g	4 choices
<b>What did you eat and drink?</b> (write it below)			
	TOTAL		

\*Carbohydrate containing food

**Related articles:** *Just the basics for healthy eating, Glycemic Index, and Sugars and sweeteners*

# DIABETES CANADA

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## Matching Insulin to Carbohydrate

Now that you have learned the basics of carbohydrate counting, you are ready to move on to matching your insulin to the amount of carbohydrate that you eat. If you do not understand carbohydrate counting basics, speak with your healthcare team before learning how to match insulin to carbohydrate. **At the beginning, it is important to have the same carbohydrate intake at breakfast, lunch, and supper from day to day. This will help you decide on the amount of insulin you need to cover the carbohydrate that you eat.** Knowing how to match your insulin doses to what you eat allows you more flexibility in the total amount of carbohydrate that you eat at a meal.

### What is an insulin to carbohydrate ratio?

An insulin to carbohydrate ratio, or simply carbohydrate ratio, is the number of grams of carbohydrate that 1 unit of rapid acting insulin will cover. On average, 1 unit of rapid-acting insulin will cover 10–15 grams of carbohydrate. This average number is sometimes used as a starting point. However, since everyone is different, **it is important to decide how much carbohydrate is covered by 1 unit of insulin for you.** Your ratio could vary from meal to meal, with active or less active days, or because of illness or stress.

### How do I decide what my insulin to carbohydrate ratio is?

You will need to monitor and keep track of the following:

- Your blood sugar levels before and 2 hours after the first bite of your meal. It is best to work out a ratio for one meal at a time.
- The food that you ate and number of grams of carbohydrate eaten at that meal. (Remember to subtract the fibre).
- The number of units of rapid-acting insulin you took at that meal.
- Any extra activity or exercise. It is best to keep exercise constant during the time that you are trying to decide your insulin to carbohydrate ratio.

It is best to work on this when your blood sugars are fairly stable and in the healthy ranges. Healthy blood sugar targets are 4–7 mmol/L before a meal and 5–10 mmol/L 2 hours after the first bite of a meal. If your pre-meal blood sugar is higher than 4–7 mmol/L, an acceptable rise in blood sugar 2 hours after the meal should be no more than 3 points.

You will need to increase or decrease the dose of your rapid-acting insulin by 1–2 units every 3 days until your blood sugars are more often in your target ranges. You may also need to adjust the dose of your longer-acting insulin. Speak with your diabetes team about these adjustments.

Once you are getting blood sugar readings in your target ranges most of the time, you can calculate your insulin to carbohydrate ratio. Calculate your carbohydrate ratio once you have target blood sugar readings from 3 or more meals at the same time of day.

Remember the carbohydrate ratio is the number of grams of carbohydrate 1 unit of rapid-acting insulin will cover. Work out the grams of carbohydrate that you ate at that meal and divide by the number of units of rapid-acting insulin that you took.

$$\frac{\text{Grams of Carbohydrate}}{\text{Units of Rapid-Acting Insulin Taken}} = \text{Carbohydrate Ratio}$$

Example:  $\frac{90 \text{ grams of carbohydrate}}{9 \text{ units of rapid-acting insulin taken}} = 10$

In this example, 1 unit of rapid-acting insulin will cover 10 grams of carbohydrate.

Use your information to figure out your carbohydrate ratios:

Your carbohydrate ratio for breakfast is: \_\_\_\_\_

Your carbohydrate ratio for lunch is: \_\_\_\_\_

Your carbohydrate ratio for supper is: \_\_\_\_\_

\*If your answer is a decimal, always round **up** to the nearest whole number. For example, 9.3 would be rounded up to 10.

Now you can vary the amount of carbohydrate that you eat at a meal and take the amount of insulin you need to cover the carbohydrate. You will need to re-assess your ratio once in a while.

$$\frac{\text{Grams of Carbohydrate}}{\text{Carbohydrate Ratio}} = \text{Insulin Dose for Carbohydrate}$$

Example:  $\frac{80 \text{ grams of carbohydrate}}{10} = 8 \text{ units of insulin}$

\*If your answer is a decimal, always round **down** to the nearest whole number. For example, 8.7 would be 8.

## How do I decide what my correction factor is?

A correction factor is the number of points that your blood sugar is expected to drop with 1 unit of rapid-acting insulin. Your correction factor can also be written as a ratio. For example, a 1:2 ratio means that 1 unit of rapid-acting insulin will drop your blood sugar about 2 points. Knowing your correction factor can help you make insulin adjustments at meals when your blood sugar is higher than your target.

TDD stands for **T**otal **D**aily **D**ose of insulin. This includes both your rapid- and longer-acting insulin. If your total daily dose of insulin is always changing, use an average number.

Use the formula below to see what your correction factor is:

$$\frac{100}{\text{TDD}} = \text{Correction Factor}$$

Example:  $\frac{100}{50} = 2$

Calculate your Correction Factor:
Your TDD is _____
100 divided by your TDD is _____

\*If your answer is a decimal, always round **up** to the nearest whole number. For example 1.4 would be 2.

Once you know your correction factor, you can calculate how much insulin to take for a correction dose. A correction dose is used to correct for a pre-meal blood sugar that is above your target. The correction dose will help to bring your blood sugar into your target range before your next meal. You should know your insulin to carbohydrate ratio before adding a correction dose of insulin at your meals.

## How do I use my correction factor to calculate my correction dose?

The formula below will help you calculate how much insulin you will have to take to correct for a pre-meal blood sugar that is above your target.

$$\frac{\text{Actual blood sugar} - \text{Target blood sugar}}{\text{Correction Factor}} = \text{Correction Dose}$$

For example, if your pre-meal blood sugar is 10 and your target is 6, then your correction dose is:

$$\frac{10 - 6}{4} = \frac{4}{4} = 1 \text{ unit}$$

\*If your answer is a decimal, always round **down** to the nearest whole number. For example 1.6 would be 1.

The correction dose of insulin that you would need to take in this example would be 1 unit of rapid-acting insulin.

## Putting the Carbohydrate Ratio and Correction Dose Together

Once you have calculated your carbohydrate ratio (the amount of insulin that you need for your meal) and your correction dose (the amount of insulin you will need to correct for a pre-meal blood sugar that is above your target), you add them together to get your dose of insulin for that meal.

Example: Following the examples given above, you need 8 units of insulin to cover your meal plus another 1 unit to correct for a pre-meal blood sugar above your target. Your dose of rapid-acting insulin at that meal will be 9 units.

Adapted from:

1. American Diabetes Association, Advanced Carbohydrate Counting (2003)
2. Walsh, John, Roberts, Ruth : Pumping Insulin (4th edition). Torrey Pines Press. San Diego, CA. 2006
3. Pearson, Jan, Bergenstal, Richard: Fine-Tuning Control: Pattern Management Versus Supplementation. Diabetes Spectrum. 14:75-78, 2001
4. Building Competency in Diabetes Education: The Essentials. Diabetes Educator Section of the Canadian Diabetes Association. 2004.

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*This material is for information purposes only. It should not be used in place of medical advice, instruction and/or treatment. If you have questions, speak with your doctor or appropriate healthcare provider.*

# Glycemic Index Food Guide

The glycemic index (GI) is a scale that ranks a carbohydrate-containing food or drink by how much it raises blood sugar levels after it is eaten or drunk. Foods with a high GI increase blood sugar higher and faster than foods with a low GI.

There are three GI categories:



## Green = Go

Low GI (55 or less) Choose Most Often

## Yellow = Caution

Medium GI (56 to 69) Choose Less Often

## Red = Stop and think

High GI (70 or more) Choose Least Often

Foods in the high GI category can be swapped with foods in the medium and/or low GI category to lower GI.

## A low GI diet may help you:

- decrease risk of type 2 diabetes and its complications
- decrease risk of heart disease and stroke
- feel full longer
- maintain or lose weight

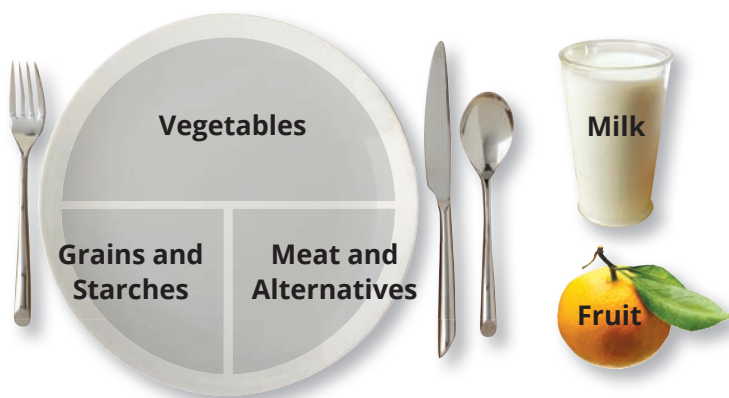
## Try these meal planning ideas to lower meal GI:

- Cook your pasta al dente (firm). Check your pasta package instructions for cooking time.
- Make fruits and milk part of your meal plate (Figure 1). These foods often have a low GI and make a healthy dessert.
- Try lower GI grains, such as barley and bulgur.
- Pulses can be grains and starches or meat and alternatives. Swap half of your higher GI starch food serving with beans, lentils or chickpeas. For example, instead of having 1 cup of cooked short grain rice, have ½ cup of cooked rice mixed with ½ cup of black beans.

## Diabetes Canada recommends choosing lower GI foods and drinks more often to help control blood sugar.

Work with your Registered Dietitian to add foods and drinks to your lists, create action plans that include choosing lower GI foods, adapt your favourite recipes, and find ways to swap/substitute low GI foods into your meal plan.

Checking your blood sugar before, and 2 hours after, a meal is the best way to know how your body handles certain foods and drinks.



**Figure 1:** The Plate Method. Using a standard dinner plate, follow this model to control your portion sizes. [www.diabetes.ca/mealplanning](http://www.diabetes.ca/mealplanning)

Some carbohydrate-containing foods and drinks have so little carbohydrate that they do not have a GI value. This does not mean they cannot be included as part of a healthy diet. Examples include green vegetables, lemons, and some low-carbohydrate drinks. Diabetes Canada calls these foods and drinks “free” because they do not impact the blood sugar of people living with diabetes. You can put free foods in the green category, but they do not have a GI and have not been included in the food lists.



**Items with this symbol are “sometimes foods”**

(foods and drinks eaten only on occasion)

# Grains and Starches

## Low Glycemic Index (55 or less) Choose Most Often

### Breads:

Heavy Mixed Grain Breads  
Spelt Bread  
Sourdough Bread  
Tortilla (Whole Grain)

### Cereal:

All-Bran™ Cereal  
All-Bran Buds™  
With Psyllium Cereal  
Oat Bran  
Oats (Steel Cut)

### Grains:

Barley  
Bulgur  
Mung Bean Noodles  
Pasta (Al Dente, Firm)  
Pulse Flours  
Quinoa  
Rice (Converted, Parboiled)

### Other:

Peas  
Popcorn  
Sweet Potato  
Winter Squash

### Additional foods:

- 1.
- 2.
- 3.

## Medium Glycemic Index (56 to 69) Choose Less Often

### Breads:

Chapati (White, Whole Wheat)  
Flaxseed/Linseed Bread  
Pita Bread (White, Whole Wheat)  
Pumpernickel Bread  
Roti (White, Whole Wheat)  
Rye Bread  
(Light, Dark, Whole Grain)  
Stone Ground Whole  
Wheat Bread  
Whole Grain Wheat Bread

### Cereal:

Cream of Wheat™ (Regular)  
Oats (Instant)  
Oats (Large Flake)  
Oats (Quick)

### Grains:

Basmati Rice  
Brown Rice  
Cornmeal  
Couscous  
(Regular, Whole Wheat)  
Rice Noodles  
White Rice (Short, Long Grain)  
Wild Rice

### Other:

Beets\*  
Corn  
French Fries   
Parsnip  
Potato (Red, White, Cooled)  
Rye Crisp Crackers  
(e.g. Ryvita Rye Crispbread™)  
Stoned Wheat Thins™  
Crackers

### Additional foods:

- 1.
- 2.
- 3.

## High Glycemic Index (70 or more) Choose Least Often

### Breads:

Bread (White, Whole Wheat)  
Naan (White, Whole Wheat)

### Cereal:

All-Bran Flakes™ Cereal  
Corn Flakes™ Cereal  
Cream of Wheat™ (Instant)  
Puffed Wheat Cereal  
Rice Krispies™ Cereal  
Special K™ Cereal

### Grains:

Jasmine Rice  
Millet  
Sticky Rice  
White Rice (Instant)

### Other:

Carrots\*  
Potato (Instant Mashed)  
Potato (Red, White, Hot)  
Pretzels  
Rice Cakes  
Soda Crackers

### Additional foods:

- 1.
- 2.
- 3.

\* Most starchy/sweet vegetables (e.g. peas, parsnip, winter squash) provide 15 g or more carbohydrate per 1 cup serving. Beets and carrots often provide less than 15 g carbohydrate per serving (marked above with \*). Most non-starchy (or free) vegetables (e.g. tomato and lettuce) have not been assigned a GI because they have very little carbohydrate and have very little effect on blood sugar.

# Fruits

## Low Glycemic Index (55 or less) Choose Most Often

Apple  
 Apricot (Fresh, Dried)  
 Banana (Green, Unripe)  
 Berries  
 Cantaloupe  
 Grapefruit  
 Honeydew Melon  
 Mango  
 Orange  
 Peach  
 Pear  
 Plum  
 Pomegranate  
 Prunes

### Additional foods:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

## Medium Glycemic Index (56 to 69) Choose Less Often

Banana (Ripe, Yellow)  
 Cherries (Bottled) ▲  
 Cherries (Fresh)  
 Cranberries (Dried)  
 Figs (Fresh, Dried)  
 Grapes  
 Kiwi  
 Lychee  
 Pineapple  
 Raisins

### Additional foods:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

## High Glycemic Index (70 or more) Choose Least Often

Banana (Brown, Overripe)  
 Watermelon

### Additional foods:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Some fruits have not been assigned a GI because they contain less than 15 g of available carbohydrate per serving (e.g. lemon and lime).




Many fruits and vegetables fall in the low or medium GI categories.



# Milk, Alternatives and Other Beverages

**Low Glycemic Index  
(55 or less)  
Choose Most Often**

Almond Milk  
 Cow Milk  
 (Skim, 1%, 2%, Whole)  
 Frozen Yogurt   
 Greek Yogurt  
 Soy Milk  
 Yogurt (Skim, 1%, 2%, Whole)

**Additional foods:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**Medium Glycemic Index  
(56 to 69)  
Choose Less Often**

**Additional foods:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**High Glycemic Index  
(70 or more)  
Choose Least Often**

Rice Milk

**Additional foods:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Milk, alternatives, and other beverages listed include flavoured (e.g. chocolate), sweetened and unsweetened varieties.

# Meat and Alternatives

**Low Glycemic Index  
(55 or less)  
Choose Most Often**

Baked Beans  
 Chickpeas  
 Kidney Beans  
 Lentils  
 Mung Beans  
 Romano Beans  
 Soybeans/Edamame  
 Split Peas

**Additional foods:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**Medium Glycemic Index  
(56 to 69)  
Choose Less Often**

Lentil Soup (ready-made)  
 Split Pea Soup (ready-made)

**Additional foods:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**High Glycemic Index  
(70 or more)  
Choose Least Often**

**Additional foods:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Meat, poultry and fish do not have a GI because they do not contain carbohydrate. When ½ cup or more of pulses are eaten, they can be included in the Grains and Starches food group or the Meats and Alternatives group.

Diabetes Canada is making the invisible epidemic of diabetes visible and urgent. Eleven million Canadians have diabetes or prediabetes. Now is the time to End Diabetes - its health impacts, as well as the blame, shame and misinformation associated with it. Diabetes Canada partners with Canadians to End Diabetes through education and support services, resources for health-care professionals, advocacy to governments, schools and workplaces, and funding research to improve treatments and find a cure.

This document reflects the *Canadian Diabetes Association 2013 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada* © 2013 The Canadian Diabetes Association. The Canadian Diabetes Association is the registered owner of the name Diabetes Canada. 115009 02/18

## Sweeteners that **INCREASE** blood sugar levels

Sweetener	Forms & uses	Other things you should know...
<b>Sugars (Some examples)</b>		
<ul style="list-style-type: none"> <li>• Agave syrup</li> <li>• Barley malt</li> <li>• Brown rice syrup</li> <li>• Brown sugar</li> <li>• Corn syrup</li> <li>• Dextrose</li> <li>• Fructose</li> <li>• Fruit juice concentrates</li> <li>• Glucose</li> <li>• High fructose corn syrup</li> <li>• Honey</li> <li>• Icing sugar</li> <li>• Invert sugar</li> <li>• Lactose</li> <li>• Maltodextrins</li> <li>• Maltose</li> <li>• Maple syrup</li> <li>• Molasses</li> <li>• Sucrose</li> <li>• White sugar</li> </ul>	<ul style="list-style-type: none"> <li>• Used to sweeten foods and beverages</li> <li>• May be found in medications</li> </ul>	<ul style="list-style-type: none"> <li>• Sugars are carbohydrates that can affect your blood sugar (glucose), weight and blood fats.</li> <li>• There is no advantage to those with diabetes in using one type of sugar over another.</li> <li>• Sugars may be eaten in moderation by people with diabetes. Up to 10% of the days calories can come from added sugar. Their effect on blood sugar levels will vary. Talk to your dietitian about how to fit sugars into your meal plan.</li> </ul>

## Sweeteners that **DON'T INCREASE** blood sugar levels

Sweetener	Forms & uses	Other things you should know...
<b>Sugar Alcohols</b>		
<ul style="list-style-type: none"> <li>• Hydrogenated starch hydrolysates (HSH)</li> <li>• Isomalt</li> <li>• Lactitol</li> <li>• Maltitol</li> <li>• Mannitol</li> <li>• Palatinit</li> <li>• Polydextrose</li> <li>• Polyol syrups</li> <li>• Polyols</li> <li>• Sorbitol</li> <li>• Xylitol</li> </ul>	<ul style="list-style-type: none"> <li>• Used to sweeten foods labelled "sugar free" or "no added sugar"</li> <li>• May be found in cough and cold syrups and other liquid medications (e.g. antacids)</li> </ul>	<ul style="list-style-type: none"> <li>• Sugar alcohols are neither sugars nor alcohols. Small amounts are found naturally in fruits and vegetables. They can also be manufactured.</li> <li>• They are only partly absorbed by your body, have fewer calories than sugar and have no major effect on blood sugar.</li> <li>• Check product labels for the number of grams of sugar alcohols per serving. If you eat more than 10 grams of sugar alcohols a day, you may experience side effects such as gas, bloating or diarrhea.</li> <li>• Talk to your dietitian if you are carbohydrate counting and want to use foods sweetened with sugar alcohols.</li> </ul>

Health Canada has approved the following sweeteners as safe if taken in amounts up to the Acceptable Daily Intake (ADI). These sweeteners may also be used in medications. Please read the label. Ingredients may change. New products may be available.

Sweetener	Common/ Brand name	Forms & uses	Other things you should know...
Acesulfame Potassium (Ace-K)	Not available for purchase as a single ingredient	<ul style="list-style-type: none"> <li>Added to packaged foods and beverages only by food manufacturers</li> </ul>	<ul style="list-style-type: none"> <li>Safe in pregnancy*</li> <li>ADI=15 mg/kg body weight per day For example, a 50 kg (110 lb) person could have 750 mg of Ace-K per day. One can of diet pop contains about 42 mg of Ace-K.</li> </ul>
Aspartame	<ul style="list-style-type: none"> <li>Equal®</li> <li>NutraSweet®</li> <li>Private label brand</li> </ul>	<ul style="list-style-type: none"> <li>Available in packets, tablets or granulated form</li> <li>Added to drinks, yogurts, cereals, low calorie desserts, chewing gum and many other foods</li> <li>Flavour may change when heated</li> </ul>	<ul style="list-style-type: none"> <li>Safe in pregnancy*</li> <li>ADI=40 mg/kg body weight per day For example, a 50 kg (110 lb) person could safely have 2000 mg of aspartame per day. One can of diet pop may contain up to 200 mg of aspartame.</li> </ul>
Cyclamate	<ul style="list-style-type: none"> <li>Sucaryl®</li> <li>Sugar Twin®</li> <li>Sweet'N Low®</li> <li>Private label brand</li> </ul>	<ul style="list-style-type: none"> <li>Available in packets, tablets, liquid and granulated form</li> <li>Not allowed to be added to packaged foods and beverages</li> <li>Flavour may change when heated</li> </ul>	<ul style="list-style-type: none"> <li>Safe in pregnancy* (Be cautious of exceeding the ADI)</li> <li>ADI=11 mg/kg body weight per day For example, a 50 kg (110 lb) person could have 550 mg of cyclamate per day. One packet of Sugar Twin® contains 264 mg of cyclamate.</li> </ul>
Saccharin	<ul style="list-style-type: none"> <li>Hermesetas®</li> </ul>	<ul style="list-style-type: none"> <li>Available as tablets</li> <li>Not allowed to be added to packaged foods and beverages</li> </ul>	<ul style="list-style-type: none"> <li>Safe in pregnancy*</li> <li>ADI=5 mg/kg body weight per day For example, a 50 kg (110 lb) person could have 250 mg of saccharin per day. One tablet of Hermesetas® contains 12 mg of saccharin.</li> <li>Available only in pharmacies</li> </ul>
Sucralose	<ul style="list-style-type: none"> <li>Splenda®</li> </ul>	<ul style="list-style-type: none"> <li>Available in packets or granulated form. Added to packaged foods and beverages</li> <li>Can be used for cooking and baking</li> </ul>	<ul style="list-style-type: none"> <li>Safe in pregnancy*</li> <li>ADI=9 mg/kg body weight per day For example, a 50 kg (110 lb) person could have 450 mg of sucralose per day. One packet of Splenda® contains 12 mg of sucralose; one cup (250 mL) contains about 250 mg of sucralose.</li> </ul>
Steviol glycosides	Stevia-based sweeteners such as: <ul style="list-style-type: none"> <li>Stevia</li> <li>Truvia</li> <li>Krisda</li> <li>Pure Via</li> </ul>	<ul style="list-style-type: none"> <li>Table top sweeteners</li> <li>Added to drinks, breakfast cereals, yogurt, fillings, gum, spreads, baked products, snack foods</li> </ul>	<ul style="list-style-type: none"> <li>Safe in pregnancy*</li> <li>ADI= 4mg /kg body weight per day For example a 50kg (110 lb) person could have 200mg of Stevia per day. A 30g portion of breakfast cereal may contain 11mg of steviol glycosides</li> </ul>

\*For nutritional reasons, pregnant women should not consume excessive products containing artificial sweeteners, since such foods could replace more nutritious foods.



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**As a general rule, there is no need to avoid alcohol because you have diabetes.**

You *should not* drink alcohol if you:

- are pregnant or trying to get pregnant
- are breastfeeding
- have a personal or family history of drinking problems
- are planning to drive or engage in other activities that require attention or skill
- are taking certain medications. Ask your pharmacist about your medications.

**Consider the following questions when deciding what is best for you.**

	Yes	No
<b>1</b> Is my diabetes under control?	<input type="checkbox"/>	<input type="checkbox"/>
<b>2</b> Am I free from health problems that alcohol can make worse such as disease of the pancreas, eye disease, high blood pressure, high triglycerides, liver problems, nerve damage or stroke?	<input type="checkbox"/>	<input type="checkbox"/>
<b>3</b> Do I know how to prevent and treat low blood sugar?	<input type="checkbox"/>	<input type="checkbox"/>

If you answered “no” to any of these questions, you should speak to your diabetes educator or health-care professional before drinking alcohol.

If you answered “yes” to all of these questions, it is OK to drink alcohol in moderation.

**Moderate alcohol intake is limited to 2 standard drinks/ day or less than 10 drinks/ week for women; and limited to 3 standard drinks/ day or less than 15 drinks/ week for men.**

This recommendation is the same for people without diabetes. For people with high blood pressure, alcohol should be limited to 1 drink/day for women and 2 drinks/day for men.



## What is a “standard drink”?

### 1 standard drink (10 g of alcohol):



#### Beer

341 mL (12 fl.oz)  
of regular strength beer  
(5% alcohol)



#### Spirits

43 mL (1.5 fl.oz) of spirits  
(40% alcohol)



#### Wine

142 mL (5 fl.oz) of wine  
(12% alcohol)

Note: If you are carbohydrate counting, do not take insulin for the carbohydrate content of alcoholic drinks.

## Health risks of alcohol use

You may have heard that alcohol has certain health benefits. However, any pattern of drinking can be harmful. Proven ways of improving your health include: healthy eating, being active, and being a non-smoker.

### The Diabetes Canada Clinical Practice Guidelines recommend that:

- People with type 1 diabetes should be aware that moderate consumption of alcohol with, or 2 to 3 hours after, an evening meal may result in delayed low blood sugar (hypoglycemia) the next morning after breakfast, or up to 24 hours after alcohol consumption. This also applies to people with type 2 diabetes who are using insulin or insulin secretagogues.
- Alcohol should be limited to 2 standard drinks/ day or less than 10 drinks/ week for women, and limited to 3 standard drinks/ day or less than 15 drinks/ week for men.
- People with diabetes should discuss alcohol use with their diabetes health-care team.

## Risks for people with diabetes

### Alcohol can:

- affect judgement
- provide empty calories that might lead to weight gain if taken in excess
- increase blood pressure and triglycerides
- cause damage to liver and nerves including brain and sexual organs
- contribute to inflammation of the pancreas
- dehydrate the body which is very dangerous in someone with high blood sugar
- worsen eye disease

### For young people in particular, alcohol use:

- can lead to addiction
- is associated with a dramatic increase in injuries and death



## For those on insulin or some diabetes medications

Drinking alcohol can increase your risk of having low blood sugar. To reduce this risk, take the following steps:

### BEFORE drinking alcohol

Eat regular meals, take your medication(s), and check your blood sugar levels frequently (keep your blood glucose meter with you).

- Always have a treatment for low blood sugar with you (such as 3 glucose tablets or 150 mL regular pop or 6 Life Savers®).
- Wherever you are, make sure someone with you knows your signs and symptoms of low blood sugar and how to treat it so they can help you.
- Be aware that glucagon, a treatment for low blood sugar, will not work while alcohol is in the body. Because of this, make sure that someone knows to call an ambulance if you pass out.
- Wear diabetes identification such as a MedicAlert® bracelet.

### WHILE drinking alcohol

- Eat carbohydrate-rich foods when drinking alcohol. Some ideas:

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- Eat extra carbohydrate-rich foods if you are dancing, playing sports or doing other physical activity.
- Always pour your own drinks. Use less alcohol and stretch your drinks with sugar-free mixes.
- Drink slowly. Make your second drink without alcohol.

### AFTER drinking alcohol

- Tell a responsible person that you have been drinking. They should look for low blood sugar symptoms.

(eg.)

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- Check your blood sugar before going to bed. Eat a carbohydrate snack if your blood sugar is lower than usual.
- Set an alarm or have a responsible person wake you up through the night and early morning – a delayed low blood sugar can occur **anytime up to 24 hours** after drinking alcohol.
- You need to get up on time the next day for any food, medication or insulin you normally take. Missed medication or insulin can lead to high blood sugar, ketones and diabetic ketoacidosis (DKA).

## Carbohydrate and calorie content in some common alcoholic beverages and mixes

(The amounts listed are a general guide only)

Beverage	Standard serving size	Energy (kcal)	Carbohydrate content (g)
<b>Beer:</b>			
regular	341 mL (12 fl.oz)	147	12
light	341 mL (12 fl.oz)	99	6
non-alcoholic*	355 mL (~12 fl.oz)	40-80	9-17
low carb*	341 mL (12 fl.oz)	96	3
<b>Spirits/Hard liquor</b>	43 mL (1.5 fl.oz)	98	0
<b>Liqueurs &amp; Cordials</b>	43 mL (1.5 fl.oz)	155-190	10-25
<b>Wine:</b>			
regular	142 mL (5 fl.oz)	106-127	2-4
dessert	142 mL (5 fl.oz)	233-243	18-21
non-alcoholic	142 mL (5 fl.oz)	9	2
<b>Cooler:</b>			
regular	355 mL (12 fl.oz)	178-258	21-38
light*	330 mL (12 fl.oz)	100	1
<b>Mixes:</b>			
Sugar free pop	250 mL (8 fl.oz)	0	0
Regular pop	250 mL (8 fl.oz)	107	28
Club soda	250 mL (8 fl.oz)	0	0
Tonic water	250 mL (8 fl.oz)	88	23
Orange juice	250 mL (8 fl.oz)	118	27
Tomato juice	250 mL (8 fl.oz)	44	9
Tomato and clam juice	250 mL (8 fl.oz)	123	28

Reference: Canadian Nutrient File, 2018; USDA Food Composition Databases, 2018; \*Actual Label

The caloric and carbohydrate content may vary by brand, be sure to check the labels

### THE BOTTOM LINE

- If you do not drink alcohol, don't start.
- If you choose to drink alcohol, intake should be moderate (daily intake should be limited to 2-3 drinks for adult men and 1-2 drinks for adult women). When drinking alcohol, make sure you know how to prevent and treat low blood sugar.
- Heavy alcohol drinkers (more than 21 drinks/week for men and more than 14 drinks/week for women) are strongly advised to reduce the amount of alcohol they drink. Heavy alcohol use can make blood sugar control more difficult and increases other health risks.
- Talk to your diabetes educator or health-care professional if you have questions.

**Related article:** *High blood pressure and diabetes*

**DIABETES  
CANADA**

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## Diabetes and Driving

- If you drive and have diabetes, it's important to know that a low blood sugar (hypoglycemia) can greatly affect your judgement and driving skills. Your ability to drive can be impaired for at least **45 minutes** after a low blood sugar has been treated and is back to normal.
- Talk to your doctor, diabetes educator, or pharmacist to see if the diabetes medicine you're taking puts you at risk for low blood sugars. If you're at risk, follow these guidelines to keep you and others safe.

### Getting Ready to Drive

- Check with your licensing body about how often you need a medical exam to keep your license.
- Always have your blood sugar meter (glucometer) with you. Use a glucometer with an electronic memory or keep a record of your blood sugar levels.
- Wear your medical alert identification that says you have diabetes.
- Make sure you have quick-acting sugar (e.g., glucose tablets, juice) within easy reach of the driver's seat (e.g., attach it to the sun visor or the centre console).
- Keep snacks with carbohydrate and protein in your car (e.g., nuts and dried fruit, snack bar).

### Before Driving

Test your blood sugar right before driving. Monitor your blood sugar at least every 4 hours when driving long distances. Your blood sugar must be **over 4.0 mmol/L** to drive.

#### If your blood sugar is **lower than 4.0 mmol/L**:

- Take 15 grams of quick-acting sugar (e.g., ½ cup juice/regular pop, 4-Dex 4 tablets®, or 6 LifeSavers®).
- Wait 15 minutes and re-check your blood sugar. If below 4.0 mmol/L, re-treat with 15 grams of quick-acting sugar.
- Once over 4.0 mmol/L, have a snack.
- Wait at least 45 minutes after eating a snack and your blood sugar level is at least 5.0 mmol/L before you drive.

### While You're Driving

- If you think your blood sugar is low, pull off the road, test your blood sugar, and treat like above.

*For more information about private and commercial driving with diabetes, go to [diabetes.ca](http://diabetes.ca) and search for driving and licensing.*

*This material is for information purposes only. It should not be used in place of medical advice, instruction and/or treatment. If you have questions, speak with your doctor or appropriate healthcare provider.*

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## What kind of activity is best?

Both aerobic and resistance exercise are important for people living with diabetes.

### Aerobic exercise

Aerobic exercise is continuous exercise such as walking, bicycling or jogging that elevates breathing and heart rate.

### Resistance exercise

Resistance exercise involves brief repetitive exercises with weights, weight machines, resistance bands or one's own body weight to build muscle strength. If you decide to begin resistance exercise, you should first get some instruction from a qualified exercise specialist, a diabetes educator or exercise resource (such as a video or brochure) and start slowly.

### Interval training

Interval training involves short periods of vigorous exercise such as running or cycling, alternating with 30 second to 3 minute recovery periods at low-to-moderate intensity or, rest.

## Why is activity so important for people with diabetes?

Almost everyone, whether or not they have diabetes, benefits from regular exercise. Well-known health benefits include weight loss, stronger bones, improved blood pressure control, lower rates of heart disease and cancer as well as increased energy levels.

Regular exercise also has special advantages if you have type 2 diabetes. Regular physical activity improves your body's sensitivity to insulin and helps manage your blood sugar levels.

## Safety first

- If you have been inactive for some time, talk to your doctor before starting any exercise program that is more strenuous than brisk walking.
- Make sure you wear comfortable, proper-fitting shoes.
- Wear your MedicAlert® bracelet or necklace.
- Listen to your body. Speak to your doctor if you are very short of breath or have chest pain.
- If you take insulin or medications that increase insulin levels, monitor your blood sugar before, during and many hours after your activity to see how it affects your blood sugar levels.
- Carry some form of fast-acting carbohydrate with you in case you need to treat low blood sugar (hypoglycemia), for example, glucose tablets or Life Savers®.
- If you live with type 1 diabetes, speak to your health-care provider about additional strategies to reduce the risk of hypoglycemia during and after exercise.

	Minutes	Times per week
My plan for aerobic exercise is :		
My plan for resistance exercise is :		



## How much is enough?

Your goal should be to complete **at least 150 minutes of moderate- to vigorous-intensity aerobic exercise each week**, (e.g. 30 minutes, 5 days a week).

You may have to start slowly, with as little as 5 to 10 minutes of exercise per day, gradually building up to your goal. The good news, though, is that multiple, shorter exercise sessions of at least 10 minutes, adding up to 90-140 minutes per week, can have some benefits for people with diabetes. As you begin your exercise program and continue to build on it, be sure that you have no more than 2 consecutive days without exercise.

If you are able and when you are ready, try adding **resistance exercises like lifting weights 2-3 times a week**.

When you add resistance exercise, you should get some help from a qualified exercise specialist.

Note: You may consider **interval training** to increase improvements in fitness levels for type 2 diabetes, and to lower the risk of hypoglycemia in type 1 diabetes. Speak with your health-care provider or qualified exercise specialist if you plan to start interval training.

## Keep going!

Habits can be hard to change, so be prepared with a plan in case your motivation starts to fade:

- Do something you like! It is hard to stick to an activity that is not fun. It may take you a few tries before you find the activity that is right for you.
- Have a support network. Ask your family, friends and co-workers to help you stay motivated by joining you for a walk or a workout at the gym.
- Set small, attainable goals and celebrate when you reach them. Reward yourself in healthy ways.
- Add physical activity to your daily routine. While you are working or watching TV, get up every 20-30 minutes.
- Seek professional help from a personal trainer, or someone knowledgeable who can help you find a fitness regimen that will work for you.
- Using a step monitor (pedometer or accelerometer) can be helpful to track your activity.

Physical activity and diabetes can be a complex issue. For more information, talk to your health-care team or visit [diabetes.ca](http://diabetes.ca).

Regardless of your age, making the decision to become more physically active is one of the greatest gifts you can give yourself and the people who love you. Take that first step today!



**Related articles:** *Benefits of physical activity, Planning for regular physical activity, Introductory resistance program, Maintaining aerobic exercise, and Resistance exercise guidelines*

**DIABETES  
CANADA**

[diabetes.ca](http://diabetes.ca) | 1-800 BANTING (226-8464) | [info@diabetes.ca](mailto:info@diabetes.ca)

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# Activity and Type 1 Diabetes

It is important to be active when you have diabetes. Activity includes things like exercising, shopping, doing housework or yard work, and sexual activity

## How does physical activity affect diabetes?

Exercise makes the body more sensitive to insulin. This can cause your blood sugar to drop during or after the activity—sometimes for up to 24 hours.

Any type of activity can affect your blood sugar. Different activities can have different effects on your blood sugar even though you might have used the same effort.

## Blood Sugar Tips:

- Don't inject insulin into your arms or legs before doing an activity that uses those muscles.
- Reduce your insulin dose(s) when you know you will be active to prevent a low blood sugar (see *Adjusting Your Insulin for Activity* on the next page).
- Always carry a fast-acting sugar, like glucose tablets.
- Test your blood sugar:
  - before and after any activity
  - once in a while when you are doing longer activities
  - around 3 a.m. if you have a very active day or evening

## Exercising Tips:

- Make sure you wear your medical alert identification.
- Wear shoes that fit well.
- Stay well hydrated. Drink water before you start your activity. Drink about 250 mL of water for every 20 minutes you are active.
- It's a good idea to work out with someone else, especially if your activity is intense (like running a marathon).
- Don't exercise:
  - if you don't feel well
  - if you are showing ketones

## Adjusting Your Insulin Dose for Activity

Follow the guidelines below for any activity that is going to last for at least 30 minutes.

- Cut your total meal dose of rapid-acting insulin (correction and meal dose) in half (by 50%) if you are going to be active within 2 hours of your meal insulin dose, even if your blood sugar is high.

You may find you need to cut your rapid-acting insulin dose by more or less than half if your blood sugar is too low or too high during or after the activity. Your healthcare team can help you figure this out.

- If your activity wasn't planned and your insulin dose wasn't cut back in time, check your blood sugar. Have a snack that has at least 15 to 30 grams carbohydrate if:
  - your insulin dose was given within the last 2 hours
  - your blood sugar is under 7 mmol/L
  - you are worried that your blood sugar may drop too much with the activity, even if your blood sugar is over your target when you start
- Cut your bedtime long-acting insulin by 10% to 20% if you:
  - were active in the afternoon or evening
  - were active for a long time during the day (e.g., skiing, hiking, spring cleaning, painting a room)
  - did an intense activity for a short time (e.g., 30 minutes) but are usually not active
  - are planning to be active before noon the next day

### Example 1:

Mary plans to go for a run after breakfast. Her pre-breakfast reading is 12.8 mmol/L. Her correction factor is 3 (1 unit drops her 3 mmol/L), and her insulin to carbohydrate ratio is 1:15.

She plans to eat 45 grams of carbohydrate at breakfast. Her usual dose at breakfast is 5 units: 2 units as correction, and 3 units to cover her meals. To prevent a low blood sugar, she cuts this dose in half and gives 2.5 units rapid-acting insulin before she eats her breakfast. Mary will test her blood glucose during and after her exercise to see how this dose worked.

### **Example 2:**

John tests his blood sugar, gives his usual dose of rapid-acting insulin, and eats breakfast at 9:00 am. His friend calls and invites him to go for a bike ride at 10:30 a.m. John's blood sugar is 6.7 mmol/L before the ride. He eats 30 grams carbohydrate as he knows that he still has some insulin working from his breakfast dose.

Since this is the first time he has exercised at this time of the day, he's not sure what his blood sugar will do. He plans to cut his lunch dose of rapid-acting insulin in half to prevent a low blood sugar in the afternoon.

### **Example 3:**

Mary plans to go for a long run right after supper. She has not run before at this time of day. She cuts her supper dose of rapid-acting insulin in half. At bedtime, her blood sugar is 8.2 mmol/L. She cuts her long-acting insulin by 10% and takes 9 units instead of 10 units. She tests her blood sugar at 3 a.m. to make sure her blood sugar isn't too low: Her blood sugar is 7.5 mmol/L. In the morning her blood sugar is 4.4 mmol/L. If she hadn't cut back on her evening insulin, she would have had a low blood sugar by the morning.

### **Example 4:**

John is going skiing for the whole day. He decides to take half his morning basal insulin. He tests before each meal and reduces his meal dose by 50% at each meal. At bedtime, his blood sugar is 5.8 mmol/L. He eats an apple (about 20 grams carbohydrate) with cheese, and reduces his long-acting insulin by 20%.

At 3 a.m. his blood sugar is 5.6 mmol/L. He has 30 grams carbohydrate because he knows that activity can affect blood sugar for up to 24 hours. In the morning his blood sugar is 5.8 mmol/L.

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Speak with your diabetes healthcare team if you have questions or concerns about exercise and activity.

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*This material is for information purposes only. It should not be used in place of medical advice, instruction and/or treatment. If you have questions, speak with your doctor or appropriate healthcare provider.*



## Travel and Diabetes

If travel is part of your lifestyle, it is important to continue even if you have diabetes. However, extra planning is needed to make sure you have a safe and enjoyable trip.

### Getting Ready

- Make sure your diabetes is in good control.
- See your diabetes educators for help with planning for diet and time changes.
- Know your meal plan well and know what your usual serving sizes look like.
- Ask your doctor for a letter outlining your diabetes treatment plan and prescriptions for diabetes medications.

### Tips for Travelling Out of the Country

- Buy health insurance for out-of-country travel.
- If you are travelling to a developing country, make sure your immunizations are up-to-date. For more information, contact the International Travel Clinic at 403-944-7100. If you are visiting an area where malaria is common, start anti-malarial tablets a week before you leave on your trip (you need a prescription for this). Keep taking them for at least 4 weeks after leaving the area.
- Find out what kind of medical facilities are available at your destination. Contact the International Association for Medical Assistance to Travelers by phone (1-519-836-0102) or e-mail ([info@iamat.org](mailto:info@iamat.org)) for information on English-speaking doctors in foreign countries.
- Bring a translation book with you and learn some key phrases of the country you are visiting (for example, “My blood sugar is low, and I need some sugar.”).

### Packing Checklist

Here is a list of supplies you should bring on any trip:

- letter from your doctor and medical identification (for example, bracelet, necklace, wallet card)
- an extra supply of diabetes medications and blood testing equipment (bring double the amount you would normally use)
- medications to take if you feel or are sick to your stomach, have diarrhea, allergies, a fever, or pain
- sunscreen and insect repellent
- first aid kit
- supply of quick-acting sugar if on diabetes medications
- snacks (for example, juice boxes, granola bars, dried fruit, crackers, cookies)

- comfortable walking shoes and cotton socks
- translation phrase book if you are visiting a country where you do not speak the language

### Tips for Travelling by Car

- Stop once in a while for a break.
- Try to eat your meals on time (every 4–5 hours).
- In case of unexpected delays, carry some food such as cheese and crackers, fruit, and granola bars with you in the car.
- Follow your usual routine for testing your blood sugars. Test more often if you are concerned about hypoglycemia.
- If your blood sugar is low, stop driving right away and treat the low blood sugar. Check your blood sugar levels. **Do not drive** until your blood sugar is above 5 mmol/L. Even after your blood sugar returns to normal, your driving may be impaired for up to 60 minutes.

### Tips for Travelling by Airplane

- Pack your diabetes supplies in your hand luggage and carry it on the plane with you. Do not pack them in your suitcase as it may be lost. If you are travelling with others, split up the supplies and ask them to carry some with them. **Make sure all your prescription medication is in the original prescription bottle and the label is readable.**
- Carry food on the plane with you.
- You can ask the airline or your travel agent to order a diabetic meal.

### When You Get There

- If the water is not safe to drink, drink only bottled water or diet pop. Do not use ice cubes. Eat fruits and vegetables that can be peeled and/or cooked.
- Don't drink milk or other dairy products that may not be pasteurized.
- Try to continue your usual exercise routine.
- Wear sensible walking shoes and check your feet every day. Do not go barefoot, even at the beach.
- You may need to check your blood sugar levels more often because of changes in food and activity.
- If you are vomiting and/or have diarrhea, take your usual medication and see the *Sick Day* guidelines
- If you need medical advice and don't know where to find a doctor, check at a university hospital or with the Canadian Consulate or Embassy.

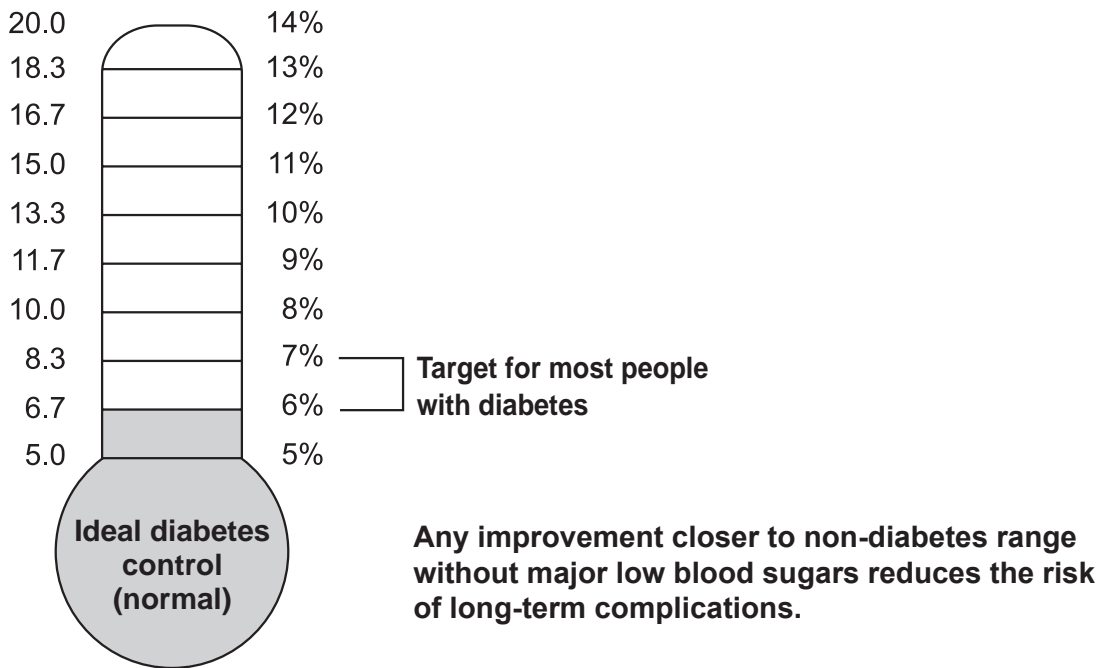
If you have any questions or concerns, ask your doctor or diabetes educator.



# A<sub>1</sub>C Testing (Adult)

- A<sub>1</sub>C is a blood test that measures your average blood sugar level over the past 2–3 months. It gives you a picture of your overall diabetes control. It is also a predictor of long-term complications.
- A<sub>1</sub>C testing should be done every 3–6 months. If you are on insulin or your blood sugars are not in target, it should be done every 3 months.

Average blood sugar in mmol/L



## Recommended Blood Sugar Targets for People with Diabetes\*

	A <sub>1</sub> C (3 month blood sugar average)	Fasting blood sugar/ blood sugar before meals (at least 3 hours since eating)	Blood sugar 2 hours after eating
<b>Target for most people with diabetes</b>	Less than or equal to 7%	4.0 to 7.0 mmol/L	5.0 to 10.0 mmol/L (5.0 to 8.0 mmol/L if A <sub>1</sub> C targets are not being met)

\*These blood sugar targets are only a guide. Talk to your doctor about the best blood sugar targets for you.

*This material is for information purposes only. It should not be used in place of medical advice, instruction and/or treatment. If you have questions, speak with your doctor or appropriate healthcare provider.*

Both type 1 and type 2 diabetes are serious conditions, and can lead to the same complications. But you can do many things to stay well. Talk to your doctor about all of the following points. They are important for basic diabetes care. Your doctor and your health-care team will work with you to ensure you get the best care. The important first steps are:

- Eat according to a healthy meal plan.
- Increase your physical activity.
- Learn as much as possible about diabetes.

## Are you heading in a healthy direction?

Keeping your blood pressure and blood sugar at target will help you avoid diabetes complications such as heart attack, stroke, and damage to your eyes, nerves and kidneys.

Refer to the back page of this brochure to find your recommended target range and use this resource to help you prepare for regular diabetes-focused visits with your health-care provider.

## Blood sugar

You and your health-care team should set goals for your blood sugar levels. It is important to recognize that you may need to add pills and/or insulin to your lifestyle changes (healthy eating and increased activity), to achieve your blood sugar targets. A blood glucose meter will help you track your blood sugar levels.

## Blood pressure

High blood pressure can lead to eye disease, heart disease, stroke and kidney disease. You may need to change your eating and exercise habits and/or take pills to keep your blood pressure below 130/80 mm Hg.

## Cholesterol

High cholesterol and other fats in the blood can lead to heart disease and stroke. You may need to change your eating and exercise habits and/or take pills to keep your blood fats at healthy levels.

## Healthy eating

Ask your doctor to refer you to a registered dietitian to learn about healthy eating. You should follow diabetes-friendly diets (Mediterranean style) or diets emphasizing specific foods (low-glycemic-index foods).

## Physical activity

Both aerobic and resistance exercise are important for people living with diabetes. If you have diabetes, you should do at least 150 minutes of moderate to vigorous intensity aerobic exercise per week. You may need to start with as little as 5 to 10 minutes per day of brisk walking. In addition, resistance exercise (such as weight training) should be performed 2-3 times per week. If you are just starting to be active, check with your doctor first.





## **Weight**

Reaching and maintaining a healthy weight will help you control your blood sugar, blood pressure and blood fat levels.

## **Eye disease**

You need to be seen by an eye-care specialist who will dilate your pupils and check for signs of eye disease. Your regular doctor cannot do this special test in his or her office. Ask for a referral to an eye-care specialist.

## **Foot care**

Take off your shoes and socks at every visit (even if your doctor or health-care team forget to ask you). Ingrown toenails, cuts and sores on the feet can lead to serious infections. Learn about proper foot care.

## **Depression and anxiety**

These are common feelings in people with diabetes and can negatively affect your diabetes control. Speak to your doctor or health-care team if you feel you might have depression or anxiety.

## **Smoking**

Smoking and diabetes are a dangerous mix. If you are serious about quitting, your doctor or health-care team can help. If you do not succeed the first time, keep trying; your health is worth it.

## **Kidney disease**

The earlier you catch signs of kidney disease the better. You must have your urine tested regularly for early signs of kidney disease. Your doctor may prescribe pills to delay more damage to your kidneys.

## **Nerve damage**

Tell your doctor or health-care team if your hands or feet ever feel numb or feel the sensation of having “pins and needles”.

## **Problems with erection**

Trouble getting and maintaining an erection is a common problem in men with diabetes. Do not be shy about talking to your doctor or health-care team about it. They may be able to suggest ways to solve the problem.

Stay healthy by asking the right questions. Be an informed patient. Know what tests you need to check for the complications of diabetes. Talk to your doctor and diabetes educators about these tests.

## Tests for diabetes care

The following are important tests for basic diabetes care. Your doctor may recommend some tests more often than indicated. Target blood sugar and blood pressure levels may differ, depending on your health.

When	What test?
<b>At diagnosis</b>	<b>Type 2:</b> <ul style="list-style-type: none"> <li>• ACR*/Kidney test: urine test performed at the lab</li> <li>• Eye examination: through dilated pupils by an eye-care specialist</li> <li>• Nerve damage test: using a 10-g monofilament or 128-Hz tuning fork</li> <li>• Cholesterol and other blood fat tests: a blood test</li> </ul>
<b>Approximately every 3 months</b>	<b>Type 1 and 2:</b> <ul style="list-style-type: none"> <li>• A1C blood test** (goal: 7.0% or below for most people with diabetes)</li> <li>• Blood pressure (goal: below 130/80 mm Hg)</li> <li>• Review of home blood sugar monitoring record</li> </ul>
<b>Every year</b>	<b>Type 1 and 2:</b> <ul style="list-style-type: none"> <li>• ACR*/Kidney test: urine test performed at the lab (at least once a year and for type 1: once a year if you have had diabetes for at least 5 years)</li> <li>• Foot exam at every visit and right away for an ingrown toenail or any cut or sore that doesn't heal</li> <li>• Meter check against the results of a blood test at the lab at least once a year</li> <li>• Cholesterol and other blood fat tests<sup>^</sup></li> </ul>
<b>Every 1 to 2 years</b>	<b>Eye examination by an eye specialist</b> <p><b>Type 2:</b></p> <ul style="list-style-type: none"> <li>• every 1–2 years (if no eye disease present)<sup>†</sup></li> </ul> <p><b>Type 1:</b></p> <ul style="list-style-type: none"> <li>• once a year<sup>†</sup> if you are over age 15 and have had diabetes for at least 5 years</li> </ul>
<b>Regularly/ Periodically</b>	<b>Type 1 and 2:</b> <ul style="list-style-type: none"> <li>• Questions about erection problems</li> <li>• Questions about depression and/or anxiety</li> <li>• Questions about healthy eating and physical activity</li> </ul>

\* Albumin/creatinine ratio (ACR)

\*\* A1C targets for pregnant women, older adults and children 12 years of age and under are different.

<sup>^</sup> More often if treatment is initiated.

<sup>†</sup> More often if eye disease is present.

For young children and pregnant women, the timing and type of test may be different.

## Your diabetes-focused visit

It is important that certain visits with your health-care team focus specifically on your diabetes.

### How to prepare

- Have laboratory tests done prior to your visit.
- Bring blood sugar records with you (written down or printed from meter).
- Bring a list of all medications including non-prescription drugs and let team know which need to be refilled.
- Write down any questions about your diabetes.
- Save any non-urgent, non-diabetes questions for another visit. This will ensure that your diabetes gets the full attention it deserves.



# A

**A1C** (measure of blood sugar levels over time)

# B

Blood pressure

# C

Cholesterol

# D

Drugs to protect your heart

# E

Exercise goals and healthy eating

# S

Self-management support

# S

Screening or monitoring for complications

# S

Smoking cessation

## Do you know your ABCDES3?

If you have diabetes, you are at increased risk for heart disease and stroke, and other complications such as eye and kidney disease, nerve damage and foot problems. Keeping your blood sugar, blood pressure and cholesterol in a healthy range can reduce your risk of complications. Learn your diabetes ABCDES3. Talk to your doctor about Diabetes Canada's recommendations for diabetes management, what targets are healthy for you, and how to achieve and maintain them over time.

ABCDES3	Recommended targets	My goals
<b>A1C*</b>	7.0% or below (for most people with diabetes)	
<b>Blood pressure</b>	Below 130/80 mm Hg	
<b>Cholesterol</b>	LDL: below 2.0 mmol/L	
<b>Drugs</b>	Speak to your health-care team about medication to protect against heart attack and stroke	
<b>Exercise goals and healthy eating</b>	<ul style="list-style-type: none"> <li>• Increase your physical activity</li> <li>• Eat according to a healthy plan</li> </ul>	
<b>Self-management support</b>	<ul style="list-style-type: none"> <li>• Set a personalized goal</li> <li>• Identify barriers to achieving goals (pain, stress, mental health, financial and/or other concerns)</li> </ul>	
<b>Screening or monitoring for complications</b>	<ul style="list-style-type: none"> <li>• Heart: ECG every 3-5 years if required</li> <li>• Foot: Yearly exam or more if required</li> <li>• Kidney: Yearly blood/urine tests or more if required</li> <li>• Eye: Yearly exam or more if required</li> </ul>	
<b>Smoking cessation</b>	Stop smoking	

\* A1C targets for pregnant women, older adults and children 12 years of age and under are different.

**Related articles:** *Managing your blood sugar, A prescription for maintaining healthy eyes, Smoking and diabetes, Cholesterol and diabetes, High blood pressure and diabetes, Managing weight and Diabetes*

# DIABETES CANADA

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## Foot care: A step toward good health

### Diabetes and your feet

Diabetes can cause nerve damage (also known as diabetes peripheral neuropathy) and poor blood flow or circulation to the legs and feet (also known as peripheral arterial disease). As a result, people with diabetes are less likely to feel a foot injury, such as a blister or cut. Diabetes can make these injuries more difficult to heal. Unnoticed and untreated, even small foot injuries can quickly become infected, potentially leading to serious complications.

Foot problems are very common in people with diabetes and can lead to serious complications. This fact sheet provides basic information about how diabetes affects your feet and what you can do to keep your feet healthy.

### Daily foot care

As always, prevention is the best medicine. A good daily foot-care routine and good blood sugar control will help keep your feet healthy.

Start by assembling a foot-care kit containing nail clippers, nail file, lotion, and a non-breakable hand mirror. Having everything you need in one place makes it easier to follow this foot-care routine every day:

- Wash your feet in warm (not hot) water, using a mild soap. Don't soak your feet, as this can dry your skin.
- Dry your feet carefully, especially between your toes.
- Thoroughly check your feet and between your toes to make sure there are no cuts, cracks, ingrown toenails, blisters, etc. Use a hand mirror to see the bottom of your feet, or ask someone else to check them for you.
- Clean cuts or scratches with mild soap and water, and cover with a dry dressing suitable for sensitive skin.
- Trim your toenails straight across and file any sharp edges. Don't cut the nails too short.
- Apply a good lotion to your heels and soles. Wipe off excess lotion that is not absorbed. Don't put lotion between your toes, as the excessive moisture can promote infection.
- Wear fresh clean socks and well-fitting shoes every day. Whenever possible, wear white socks – if you have a cut or sore, the drainage will be easy to see.



## When to see your doctor

If you have any corns (thick or hard skin on toes), calluses (thick skin on bottom of feet), in-grown toenails, warts or slivers, have them treated by your doctor or a foot-care specialist (such as a podiatrist, chiropodist or experienced foot-care nurse). Do not try to treat them yourself.

If you have any swelling, warmth, redness or pain in your legs or feet, see your doctor or foot specialist right away.

Have your bare feet checked by your doctor at least once a year. In addition, ask your doctor to screen you for neuropathy and loss of circulation at least once a year.

Take your socks off at every diabetes-related visit to your doctor and ask him or her to inspect your feet.



## Best advice

Do	Don't
Wear well-fitting shoes. They should be supportive, have low heels (less than 5 cm high) and should not rub or pinch. Shop at a reputable store with knowledgeable staff who can professionally fit your shoes.	Use over-the-counter medications to treat corns and warts. They are dangerous for people with diabetes.
Buy shoes in the late afternoon (since your feet swell slightly by then).	Wear anything tight around your legs, such as tight socks or knee-highs.
Wear socks at night if your feet get cold.	Ever go barefoot, even indoors. Consider buying a pair of well-fitting shoes that are just for indoors.
Elevate your feet when you are sitting.	Put hot water bottles or heating pads on your feet.
Wiggle your toes and move your ankles around for a few minutes several times a day to improve blood flow in your feet and legs.	Sit or cross your legs for long periods of time.
Exercise regularly to improve circulation.	Smoke. Smoking decreases circulation and healing, and significantly increases the risks of amputation.
Inspect your feet daily and in particular, feel for skin temperature differences between your feet.	Wear over-the-counter insoles - they can cause blisters if they are not right for your feet.

Contact Diabetes Canada for additional resources.

**DIABETES  
CANADA**

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## Multiple Daily Injections (MDI) Quiz: Cases for ICR, ISF

Answering these questions helps us understand your knowledge and individualize your care. Stop at any time to ask questions or ask for a calculator. Don't hesitate to let us know if these topics don't interest you right now.

Please fill in the following chart:

	Check here if unsure	Breakfast	Lunch	Supper	Bed
My insulin to carbohydrate ratio					
My insulin sensitivity factor (correction)					
My target blood sugar					

### 1. Insulin to Carbohydrate Ratios (ICR)

- Jenny has 60 grams of carbohydrate for supper. She uses an insulin-to-carbohydrate ratio of 1:10 (1 unit per 10 grams carb). How many units of insulin should she give for her food?
- For this question, use your own ratio. If you personally ate 60 grams of carbohydrate for supper, how much insulin would you give for that carbohydrate?

### 2. Insulin sensitivity factor (correction or ISF)

- Jenny checks her blood sugar before eating and it is 10.2 mmol. She uses an insulin sensitivity factor of 2 (1 unit to drop 2 mmol/L) and a target of 6 mmol. How many units of insulin does she need to correct her high blood sugar?
- 
- Pretend your blood sugar is 12 mmol/L. Fill in the blanks below.

$$\frac{12 \text{ mmol/L} - \text{ \_\_\_\_\_\_ (your target blood sugar)}}{\text{ \_\_\_\_\_\_ (your ISF)}} = \text{ \_\_\_\_\_\_ units for correction}$$

### 3. ICR + ISF

- Jenny has lunch. Her blood sugar is 12 mmol/L and her target is 6 mmol/L. She's eating 45 g carb. Her carb ratio is 1:10 and her ISF is 2. How many units of insulin should she give at lunch?



## Case Scenarios: DKA, Hypoglycemia

Please take a few minutes to answer these questions. This will help us understand your knowledge and keep you safe with diabetes. Stop at any time to ask questions!

### DKA

1. What do you think diabetic ketoacidosis (DKA) is? Check all that apply.
  - Acidic blood from too little insulin
  - A serious complication of diabetes that could result in death if not treated
  - A problem that requires more than the usual amount of correction insulin to treat
  - I'm not sure or I'd like to talk more about this
2. Jenny has a blood sugar of 18.0 mmol/L. What steps can she take to prevent DKA? Fill in the blanks.
  - Test her blood or urine for \_\_\_\_\_ because her blood sugar is over \_\_\_\_\_ mmol/L
  - If she has more than trace or 0.6 mmol/L ketones, give \_\_\_\_\_ times her usual correction insulin
  - Answer this only if you are on an insulin pump: If Jenny is on an insulin pump, follow the extra guidelines and use a \_\_\_\_\_ or \_\_\_\_\_ to give the correction insulin (not her pump).
  - I'm not sure or I'd like to talk more about this

### Hypoglycemia

1. Jenny has a blood sugar of 3.7 mmol/L before supper. What do you suggest she do?
  - a. Eat supper right away!
  - b. Eat 15 g of glucose and don't eat supper or give insulin until her blood sugar is 4.0 mmol/L or higher.
  - c. I'm not sure or I'd like to talk more about this
2. On Saturday, Jenny decides to mow the lawn after lunch. It usually takes her 45 minutes. What do you suggest she do? Circle one.
  - a. Give about half her usual meal and correction insulin with lunch
  - b. Give her usual meal and correction insulin with lunch
  - c. I'm not sure or I'd like to talk more about this
3. Jenny's sugar is 13.9 mmol/L 2 hr after lunch. She had corrected at lunch but wants to correct again. Her before meal target is 6 mmol/L. What should she do? She is not on a pump.
  - Correct down to 6 mmol/L
  - Correct down to 10 mmol/L
  - I'm not sure or I'd like to explain what I do, as I'm on an insulin pump

## Food and Blood Sugar Worksheet

Date	Fasting Blood Sugar	Breakfast and Snacks (Food and Time)	Grams of Carbs	2 Hr Blood Sugar	Before Lunch Blood Sugar	Lunch and Snacks (Food and Time)	Grams of Carbs	2 Hr Blood Sugar	Before Supper Blood Sugar	Supper and Snacks (Food and Time)	Grams of Carbs	2 Hr Blood Sugar	Bedtime Blood Sugar	Activity	Comments
													* Insulin dose:		
													* Insulin dose:		
													* Insulin dose:		
													* Insulin dose:		

Ideal blood sugar goals: **Before** meals: 4–7 mmol/L      **2 hours after** meals: 5–10 mmol/L      **Your target:** before meals \_\_\_\_\_ 2 hours after meals \_\_\_\_\_

\*When calculating the insulin dose: Add insulin for carbohydrate base dose (b) + insulin correction dose (c) and subtract any decrease in insulin for activity (a) e.g.: (b+c-a)

## How to Use the Food and Glucose Record

- Fill in each column as completely as possible. The information will help identify trends in your blood sugar.
- Use a separate row for each date.
- For each of the meal/snack columns, write down the time you ate as well as what you ate. Give as much detail as possible about portion sizes. See the example below.
- Estimate the amount of carbohydrate you ate for the meal or snack. Use measuring cups and food labels when possible. If the product does not have a label, then count 15 grams of carbohydrate for each serving of fruit, starch, or milk. Use the Beyond the Basics resource for information on the serving size.
- Test your blood sugar 2 hours after the first bite of food. Write down the result.

When recording your insulin dose, include the following information:

- The dose of rapid insulin you took for carbohydrate (base dose) + the dose of rapid insulin you took to correct a high blood sugar (correction dose). Make note of any change you made to the insulin dose for activity or other factors.
- You may choose to complete the full sheet or just work on one meal at a time.
- Use the comment section for illness, stress, or anything that could change your blood sugar readings.

### Example Record

Date	Fasting Blood Sugar	Breakfast and Snacks (Food and Time)	Grams of Carbs	2 Hr Blood Sugar	Before Lunch Blood Sugar	Lunch and Snacks (Food and Time)	Grams of Carbs	2 Hr Blood Sugar	Before Supper Blood Sugar	Supper and Snacks (Food and Time)	Grams of Carbs	2 Hr Blood Sugar	Bedtime Blood Sugar	Activity	Comments
June 15	6.7	7:30 a.m. 2 slices whole grain bread 2 tsp. margarine 1 tbsp. jam 1 small banana 1 cup skim milk Coffee, black  *Insulin Dose: 5 Rapid	30 15 15 15 <hr/> 75	9.5	6.2	12:30 p.m. Sandwich with 2 slices white bread, 2 slices ham Mustard Margarine 1 cup 1% milk Carrot sticks  * Insulin dose: 3 Rapid	30  15 <hr/> 45	8.4	12.5	6:30 p.m. 1 small chicken breast 1 cup mashed potato 1 cup broccoli 1/2 cup carrots 3/4 cup sugar-free yogurt 2 plain cookies  * Insulin dose: 4 Rapid + 2 Rapid for correction	30  15 <hr/> 60	9.7	6.5  *Insulin dose: 20 NPH	None	Stressed at work

### Metric Conversion

- 1 tsp. = 5 mL
- 1 tbsp. = 15 mL
- ½ cup = 125 mL
- ¾ cup = 175 mL
- 1 cup = 250 mL

*This material is designed for information purposes only. It should not be used in place of medical advice, instruction and/or treatment. If you have specific questions, please consult your doctor or appropriate healthcare professional.*