

blood glucose monitoring

Self-blood glucose monitoring is a valuable diabetes management tool, which enables people to check their own blood glucose levels as often as they need to or as recommended.

Why is it so important to test my blood?

Regular testing and recording of your blood glucose level can reinforce your healthy lifestyle choices as well as inform you of your response to other choices and influences.

Importantly, blood glucose level pattern changes can alert you and your health care team to a possible need for a change in how your diabetes is being managed.

Testing your blood glucose levels will help you to:

- > Develop confidence in looking after your diabetes.

- > Better understand the relationship between your blood glucose levels and the exercise you do, the food you eat and other lifestyle influences such as travel, stress and illness.

- > Know how your lifestyle choices and medication, if used, are making a difference.

- > Find out immediately if your blood glucose levels are too high (hyperglycaemia) or too low (hypoglycaemia), helping you to make important decisions such as eating before exercise, treating a 'hypo' or seeking medical advice if sick. (Refer to the individual information sheets on *Physical activity and type 2 diabetes*; *Hypoglycaemia and diabetes*; *Sick days and type 1 diabetes*; *Sick days and type 2 diabetes*).

- > Know when to seek the advice of your diabetes health team about adjusting your insulin, tablets, meal or snack planning when blood glucose goals are not being met.

A diabetes health professional such as a diabetes educator can help you to choose the meter that's best for you. Your diabetes educator will also give you all the information you need about how, where and when to test your blood glucose levels and work with you in planning a routine that works for you and the life you lead.



blood glucose monitoring

How do I test my blood?

You will need a blood glucose meter, a lancet device with lancets and test strips. The finger is pricked with the lancet to obtain a very small drop of blood which is then applied to a test strip placed in the meter. The results are displayed within seconds.

Blood glucose meters are usually sold as kits giving you all the equipment you need to start. There are many different types, offering different features and at different prices to meet individual needs. Most of these are available from your State or Territory Diabetes Organisation, pharmacies and some diabetes centres.

What do I aim for?

Successful management of diabetes is all about aiming for a careful balance between the food you eat, how active you are and the medication you take for your diabetes. Because this is a delicate balance, it can be quite difficult to achieve ideal control all the time.

For some people, the ranges will vary depending on the individual and their circumstances. While it is important to keep your blood glucose levels as close to a normal or non-diabetic state as possible to prevent complications, it is equally important to check with your diabetes educator or doctor for the range of blood glucose levels that are right and safe for you. Therefore the following information should be treated only as a general guide.

Targets for glycaemic control

Target ranges may differ depending on your age, duration of diabetes, the type of medication you are taking and if you have any other medical problems. Speak with your doctor about your individual target ranges.

Normal blood glucose levels are between 4.0–7.8mmol/L.

Type 1 diabetes ¹	
Target levels	4–6mmol/L before meals 4–8mmol/L two hours after starting meals
Type 2 diabetes ²	
Target levels	6–8mmol/L before meals 6–10mmol/L two hours after starting meals
People with type 2 diabetes who are not taking a sulphonylurea medication or insulin could aim for a blood glucose level as close to normal as possible.	
Risk of hypoglycaemia for both type 1 and type 2 (low blood glucose)	Less than 4mmol/L – if insulin or certain types of tablets are used, but does not apply to all tablets or for people who do not take any tablets for diabetes. Check with your doctor what applies to you.

¹ Targets are as recommended by the American Diabetes Association. NHMRC guidelines are currently under development.

² Targets are as recommended by the NHMRC, Blood Glucose Control in Type 2 Diabetes, (2009).

Who is at risk of LOW blood glucose (hypoglycaemia)?

- People who are using insulin or those taking diabetes tablets which increase their own insulin production **are** at risk as both medications have the effect of lowering blood glucose. They can therefore cause hypoglycaemia (low blood glucose) when blood glucose levels are less than 4mmol/L[†]. (Note: Hypoglycaemia can occur at higher blood glucose levels in children and people who have had elevated blood glucose levels for a long time).
- People whose diabetes is managed by lifestyle alone or with other types of diabetes tablets which do not increase their own insulin production, **are not** at risk of hypoglycaemia.

Are HIGH blood glucose levels dangerous?

Sometimes you may get a higher blood glucose reading than usual and you may not be able to figure out the reason. When you are sick with a virus or flu, your blood glucose levels will nearly always go up and you may need to contact your doctor, especially if ketones are present (more likely to develop in a person with type 1 diabetes). However, it is only when blood glucose levels are consistently higher than they ought to be over weeks or months that the damage-causing complications can occur.

What causes glucose levels to go up and down?

There are a number of common causes for glucose levels to increase or decrease. These include:

> Food – time eaten, type and amount of carbohydrate (eg: bread, pasta, cereals, starchy vegetables, fruit and milk)	
> Exercise or physical activity	> Illness and pain
> Diabetes medication	> Alcohol
> Emotional stress	> Other medications
> Testing techniques	

When should I test?

Your doctor or diabetes educator will help you decide how many tests are needed and the levels to aim for.

You will also be advised to record all your tests. Even though your meter may have a memory, it is important to keep a record of your readings in a diary and to take this with you to all appointments with your diabetes health team. Most meters on the market have software which allow you to download your records in different formats such as graphs and charts. Even if you can do this, it is still helpful to keep a diary, not only for your tests but also details of your daily activities, the food you eat and other relevant information. This will provide both you and your diabetes health team with important information in deciding if and how your treatment may need to be adjusted.

Ask your doctor or diabetes educator how you can use a diary to help you to better manage your diabetes.

General guidelines

- Frequency of testing may vary depending on your treatment. Check with your doctor or diabetes educator as to when it is suggested you test.

Possible times are:

- > before breakfast (fasting)
- > two hours after a meal
- > before bed

- Testing four times a day is usually recommended for people with type 1 diabetes. However many people test more often, such as those using an insulin pump (CSII – continuous subcutaneous insulin infusion).

Test more often when you are:

- > Being more physically active or less physically active
- > Sick or stressed
- > Experiencing changes in routine or eating habits eg: travelling
- > Changing or adjusting your insulin or medication
- > Experiencing symptoms of hypoglycaemia
- > Experiencing symptoms of hyperglycaemia
- > Experiencing night sweats or morning headaches

What if the test result doesn't sound right?

If you're not convinced that a result is correct, here's a suggested check list:

- > Have the strips expired?
- > Is the strip the right one for the meter?
- > Is there enough blood on the strip?
- > Has the strip been put into the meter the right way?
- > Have the strips been affected by climate, heat or light?
- > Did you wash and thoroughly dry your hands before doing the test?
- > Is the meter clean?
- > Is the meter too hot or too cold?
- > Is the calibration code correct?
- > Is the battery low or flat?

All meters will give a different result with a different drop of blood. As long as there is not a big difference (more than 2mmol/L) there is not usually cause for concern.

The accuracy of all meters can be checked with meter-specific liquid drops called control solutions. These are expensive, have a short shelf life and only last a few months once opened. However, your diabetes health professional or pharmacy may be able to do this for you at no charge.

What is a glycosylated haemoglobin (HbA1c) test?

The HbA1c test shows an average of your blood glucose level over the past 10–12 weeks and should be arranged by your doctor every 3–6 months.

Is the HbA1c the same as testing your own BGLs?

No. The HbA1c test doesn't show the highs and lows that your home testing shows. Therefore it does not replace the tests you do yourself but is used as an added tool in giving the overall picture of your blood glucose management.

How does it work?

A glycosylated haemoglobin test is possible because red blood cells (RBC) are continuously being made by your long bones and released into your circulation. When these cells are released, they pick up glucose in the blood stream at that time.

Each RBC lasts about 120 days. Therefore any blood sample will have a range of cells released over the previous 120 days with different amounts of glucose attached. The HbA1c test gives a good guide to the average.

blood glucose monitoring

What HbA1c do I aim for?

The goal for most people with diabetes will be in the 6.5–7% (48–53mmol/mol) range however this may need to be higher for children and the old and frail. Your doctor will advise.

How is HbA1c reported?

The way that HbA1c is reported is changing. HbA1c has been expressed as a percentage (%). From 2011 it will be reported in IFCC HbA1c units as mmol/mol. The new method is more accurate and consistent between laboratories. For some time both mmol/mol and % will be reported by pathology laboratories.

HbA1c %	6	7	8	9	10
HbA1c mmol/mol	42	53	64	75	86

More information

Many hospitals have a diabetes clinic where you can find out more about blood glucose monitoring. Contact your:

- > Local hospital for your nearest diabetes clinic or
- > State or Territory Diabetes Organisation on 1300 136 588

Would you like to join Australia's leading diabetes organisation?

- > Dietary services
- > Free magazines
- > Children's services
- > Educational literature
- > Product discounts
- > Support groups

For more information phone **1300 136 588** or visit your State/Territory Organisation's website:

ACT	www.diabetes-act.com.au	NSW	www.australiandiabetescouncil.com
NT	www.healthylivingnt.org.au	QLD	www.diabetesqueensland.org.au
SA	www.diabetessa.com.au	TAS	www.diabetestas.com.au
VIC	www.diabetesvic.org.au	WA	www.diabeteswa.com.au

The design, content and production of this diabetes information sheet have been undertaken by:

- > **ACT** Diabetes ACT
- > **NT** Healthy Living NT
- > **SA** Diabetes SA
- > **VIC** Diabetes Australia – Vic
- > **NSW** Australian Diabetes Council
- > **QLD** Diabetes Australia – Queensland
- > **TAS** Diabetes Tasmania
- > **WA** Diabetes WA

The original medical and educational content of this information sheet has been reviewed by the Health Care and Education Committee of Diabetes Australia Ltd. Photocopying this publication in its original form is permitted for educational purposes only. Reproduction in any other form by third parties is prohibited. For any matters relating to this information sheet, please contact National Publications at dapubs@tpg.com.au or phone 02 9527 1951.

Health professionals: For bulk copies of this resource, contact your Diabetes State/Territory Organisation as listed.

Revised August 2010 A diabetes information series from Diabetes State/Territory Organisations – Copyright© 2010