Understanding your laboratory tests

Many of the tests you have done at the laboratory can help you to understand where things are at with your diabetes. They can also help you see changes over time and whether the strategies you are using in your diabetes management are working or not.
Laboratories in New Zealand operate under strict quality control. This means that the tests you have done at the laboratory are likely to be very reliable and accurate.
The start of this section deals with the tests you may have done to find out if you have diabetes. If you already know you have diabetes, go to the second section: "What tests do I have to find out how my diabetes management is going?".

What tests can be done to find out if I have diabetes?

There are a number of tests that may be done to find out if you have diabetes.
Fasting blood glucose. A fasting blood glucose level is a measure of how much glucose is in your blood when you have not eaten any thing for the past eight to ten hours.
The test is normally taken first thing in the morning. Your doctor or nurse will ask you to have nothing to eat after you go to bed at night. When you wake up in the morning you visit the laboratory for the test before you have had anything to eat or drink (except water).
A fasting blood glucose level of either 7mmol or greater tells you that you have diabetes. If you have no symptoms of diabetes (thirst, tiredness, repeated infections and needing to pass urine often) the test should be repeated on another day.
Fasting blood glucose level is now the recommended test for finding out if you have diabetes.
A fasting blood glucose level can tell you other things as well:

If your fasting blood glucose level is between 6.1 mmol and 6.9mmol you may have a condition called "impaired fasting glycaemia" (IFG). This means that the level of glucose in your blood after eating nothing overnight is higher than it is in people without diabetes or IFG, but not as high as it is in people who have diabetes.
Most doctors will ask you to have a test called an "Oral Glucose Tolerance Test" (OGTT) if your fasting blood glucose shows that you have IFG. The oral glucose tolerance test may show that you actually have diabetes or "impaired glucose tolerance" (IGT) instead of IFG.
If your tests show that you have either IFG or IGT you need to take action to manage these conditions. Having either of these conditions means you are more likely to go on to develop diabetes. You are also at higher risk of developing cardiovascular disease, that is, disease of your heart and blood vessels.
If you have IFG or IGT you should:

- Organise to be checked once a year for diabetes (and at any time that you have the symptoms of diabetes). Ask your doctor to put you on an annual recall for this test. Or remember to have it done at a time of the year you will remember, e.g., in the New Year, in the month of your birthday.
- Make sure you eat in a healthy way
- Keep your weight in a healthy range
- Have your cholesterol checked every year
- Have your blood pressure checked often
- Have 20 - 30 minutes of moderate exercise on most days of the week

Oral Glucose Tolerance Test (OGTT). An oral glucose tolerance test is a test where you go to the laboratory before eating anything in the morning. A blood glucose level is taken. Then you will be asked to drink a glass of fluid containing 75 grams of glucose (this is a lot!). You stay in the laboratory and another blood glucose level is taken at one hour and two hours after the drink. These blood glucose levels tell you how well your body uses and stores the glucose you have taken in the drink.

You will normally be asked to do an OGTT if your doctor is unsure whether you have diabetes or not. This is normally if your fasting blood glucose is less than 7mmol but more than 6.1mmol.
You will also sometimes be asked to do an OGTT when you are pregnant. All pregnant women in New Zealand are asked to have a "glucose challenge" test when they are 28 weeks pregnant. A glucose challenge test is exactly the same as an OGTT except the amount of glucose you are asked to drink is 50 grams not 75 grams. If the results of this test show your body is not using glucose in the normal way you are asked to go on and do a full OGTT.
An OGTT is how diabetes of pregnancy (gestational diabetes) is usually diagnosed in New Zealand.
Preparing for an OGTT. An OGTT may not be accurate if you have either eaten a very low carbohydrate diet or been having very strenuous exercise in the three days before taking the test. If you are doing either of these things talk to your doctor before having an OGTT.
The most accurate results of an OGTT will be got if it is done after you have had a diet with normal amounts of carbohydrate and moderate exercise only over the previous three days.
What do the results of an OGTT mean? If you are not pregnant and your blood glucose two hours after an OGTT is 11.1 mmol or more you have diabetes.
If you are having a glucose tolerance test to see whether you have diabetes of pregnancy (gestational diabetes), and your blood glucose two hours after the glucose drink is 9mmol or more than this, you have diabetes of pregnancy (gestational diabetes).
Random blood glucose level. If you have the symptoms of diabetes you may be asked to go to the laboratory for a random blood glucose. This is a blood glucose level taken at any time of the day after you have eaten at any time (i.e. not in a fasting state). If this level is 11.1 mmol or more, you have diabetes.
Islet Cell Antibody tests. Many people with typel diabetes have antibodies in their blood that show they have the autoimmune process happening that results in typel diabetes. If you have a direct relative (parents, sibling or child) with typel diabetes you can have this test done. If you have these antibodies it tells you that it's extremely likely that you will develop typel diabetes.

What tests do I have to find out how my diabetes management is going?

Managing your diabetes means managing a number of factors in your life. You can get a good idea of how effective this management is by the results of some of the laboratory tests you have done.

What laboratory tests are done to measure my blood glucose levels?

A number of laboratory tests are currently available in New Zealand to measure your blood glucose levels. These are:

Blood (or plasma) glucose level. This measures how much glucose you have in your blood at the time the test is taken. A person without diabetes would nearly always have a blood glucose level somewhere between 4 - 7.5 mmol (a 'normal' blood glucose level).
Blood glucose series. This is a series of three tests for blood glucose levels. There are different ways of doing this kind of test but a common way is as follows:

- Day one - have your normal breakfast and medication or insulin. Have your normal mid-morning snack (if you have one) and go to the laboratory for the first blood glucose test before your lunch. Have your usual lunch (and medication or insulin if you take it), then go back to the laboratory 2 hours after lunch and have your second blood glucose test taken. Have your normal food and medication or insulin for the rest of the day.

- Day two - Have no insulin, medication or food when you wake up in the morning. Go to the laboratory as soon as you can and have your third blood glucose test taken. Once this is done have your medication or insulin and your breakfast. Your blood glucose series is now complete.

The aim of such a series is to get a 'picture' of your usual blood glucose levels on a close to normal day.

What are healthy levels for a blood glucose series? Everybody will have different target levels depending on lots of individual factors. You and your doctor need to work out what are realistic and safe target levels for you. A general guide to target levels for a blood glucose series is:

- Pre-lunch between 4.5 - 7.8mmol
- 2 hours after lunch between 4.5 - 8.5mmol
- First thing in the morning(fasting) between 4 - 6mmol

HBA1c level (also called glycosalated haemaglobin level). This measures your average blood glucose over the past 4 - 6 weeks. It measures how much glucose is stuck onto your red blood cells. Red blood cells have a life span of about 6 weeks and so the test gives a good indication of what your overall blood glucose levels have been through that time. Most diabetes specialists and GPs have a lot of confidence in this test and will use it to help show you how you are going with your blood glucose management.

HBA1c levels are measured as a percentage. The HBA1c level is not directly equivalent to blood glucose levels. For example, an HBA1c level of 13% means that your average blood glucose for the past 6 weeks has been around 18 - 19 mmol.

What are healthy HBA1c levels? Once again target HBA1c levels will vary from person to person. Work out a safe target HBA1c for you with your doctor. A general range for HBA1c levels is:

- Less than or equal to 7% is a very healthy HBA1c level
- Between 7% - 8% is a fair HBA1c level and needs work to improve
- Between 8% - 10% indicates your blood glucose levels are much too high
- Above 10% indicates your blood glucose levels are extremely high

Note: if you are taking insulin and your HBA1c level is less than 6.2% this almost certainly indicates that you are having lots of low blood glucose levels. Having HBA1c levels this low is not safe when you are taking insulin.

Fructosamine level. This measures your average blood glucose levels over the previous 2 weeks. This measure is not as commonly used in New Zealand as HBA1c levels. This is because many people feel HBA1c levels tend to be more accurate and reliable.

Some diabetes services use fructosamine as a useful measure for women who are pregnant. Because insulin needs (and consequently blood glucose levels) change so rapidly during pregnancy some services prefer to use fructosamine rather than HBA1c as it looks back over a shorter time and therefore may reflect rapid changes more effectively.

What is a healthy fructosamine level? If you are not pregnant the target healthy level is less than 300. When you are pregnant the target healthy level is less than 200.

What laboratory tests are done to measure my blood fats (Cholesterol or Lipid Levels)?

The level of cholesterol or fats in your blood is measured by a test called a blood lipid profile. This measures the level of a number of different fats in your blood. The fats that are measured are:

- Total cholesterol
- HDL Cholesterol (high density lipoproteins)
- LDL Cholesterol (low density lipoproteins
- Triglycerides

Healthy levels of these fats are:

- Total cholesterol less than or equal to 5.0mmol

- HDL Cholesterol greater than 1.0mmol
- LDL Cholesterol less than 2.5mmol
- Triglycerides less than 2.0mmol

What other lab tests am I likely to have done?

A test you will have done regularly (it should be done at least once a year) is your 'microalbuminuria' level. This is a laboratory test that is done on a sample of urine. It involves checking for microscopic amounts of protein in your urine.
Small amounts of protein leaking out into your urine is an early sign that your kidneys are developing damage from your diabetes (diabetic nephropathy). The amount of protein leaking into your urine can tell if you have kidney damage and also if it is getting worse or not.
Your microalbuminuria levels should be plotted on a graph over time. Hopefully, these levels will stay low, but if they are rising then this shows there is a problem happening with your kidneys. It is best if your microalbuminuria levels are less than 2.
If your test comes back with raised microscopic protein levels your doctor may ask for you to have the test again. This is because, sometimes, your microalbuminuria levels can be up if you have an infection or even if you have been exercising hard. If they are up for this reason this is just temporary and not a problem. Repeating the test helps to eliminate a 'false positive' for either of these reasons.
You may also have your thyroid hormone levels tested (especially if you have type1 diabetes). Checking your thyroid function involves having a sample of blood taken at the laboratory. Some diabetes clinics will check your thyroid function on a fairly regular basis. Your doctor will discuss the results with you.

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