



Testing for ketones

What are ketones and what does it mean to have them?
For people with Type 1 diabetes only.

By Louise Farmer

Ketones are a group of acids that are released into your bloodstream when your body breaks down fat very rapidly. Everyone releases small amounts of ketones from time to time. However, if you have Type 1 diabetes you are at risk of releasing dangerously large amounts of ketones. This can happen if you haven't taken enough insulin, or if you have accidentally skipped a dose, or when the insulin you have injected can't work as well as it should, for example when you are sick.

If you have a very large amount of ketones in your bloodstream, it can lead to a condition called 'diabetic ketoacidosis', sometimes called DKA.

What are ketones?

Ketones are a range of acids. Nail polish remover (acetone) is a type of ketone.

Why does diabetic ketoacidosis (DKA) happen?

DKA occurs when there are so many ketones in your bloodstream that your blood becomes acidic. This can be a life threatening condition. Fortunately it is easy to test for and, once you know how, usually easy to avoid or to treat.

How does it happen? Insulin helps your body to use the glucose in your blood for energy. If you don't have enough insulin your body can't use this glucose for fuel. So it looks around for another source of energy. It starts to break down fat for energy. It is normal to break down fat for energy sometimes. However, problems arise if you break down a large amount of fat very quickly.

Ketones are the leftover product from the breakdown of fat. Think of it like this: if you throw a log on to a fire it will burn, and the leftover product is ash. When you burn fats for energy, instead of ash the leftover product is ketones.

What can cause you to have ketones?

You develop ketones if you are not having enough insulin at any particular time. Your insulin needs will change in certain situations including:

Being sick or injured – when you are sick or injured your body releases hormones that make it resistant to the action of insulin. This will usually mean your insulin can't work as well as it normally does. At the same time, your body's need for energy increases so it can fight the infection or heal from the injury. If you don't have enough insulin your body can't get this energy from your blood glucose. It starts to break down fat for energy and can produce large amounts of ketones.

Forgetting an insulin dose – you may develop ketones if you have forgotten or skipped a dose of insulin, or if your insulin dose is too low. Developing ketones if you skip a dose can happen surprisingly quickly.

Starting on steroid medications – steroid medications can make your body more resistant to the action of insulin. If your insulin can't work properly, this may result in you burning fat for energy and producing ketones. Occasionally you may have a condition for which you need steroids. If you are starting on a new medication, always ask if it is a steroid medication. There may be another medication you can take instead that will have less of an impact on your diabetes.

How can you test for ketones?

Testing for ketones is very easy. You can test for ketones in your urine (using urine testing strips) or for ketones in your blood (using the Optium meter and blood ketone testing strips). Ask your diabetes nurse or doctor to teach you how to test for ketones.

When should you test for ketones?

You should test for ketones when:

- Your blood glucose is going up (at any level) and you are feeling unwell
- Your blood glucose is greater than 18 mmol/L and it is not coming down (even if you feel well)
- You are unable to test your blood glucose but you feel unwell
- You develop abdominal pain and/or nausea and vomiting and/or shortness of breath.

What should you do if you have ketones?

Have an action plan in advance! Work with your diabetes doctor or diabetes nurse in advance to make a plan on how you will manage your diabetes if you start to show ketones. This can save you a lot of problems.


The basic principles of managing times when you have ketones are:

- Drink lots of unsweetened fluids
- Get urgent medical advice (or follow your plan)
- Take extra short acting insulin as advised
- Take your normal insulin at the normal times
- Test often until your ketones have cleared
- Work out why you have developed ketones and sort this out.

If your ketone levels are small to moderate – drink plenty of unsweetened fluids. Get urgent medical advice immediately (or follow your plan). Your doctor or diabetes nurse will almost certainly advise you to take extra short acting insulin. Take your normal insulin also when it is due.

If your ketone levels are large, or they are moderate and you feel unwell – get urgent medical advice immediately, even if this means travelling to the nearest hospital (this trip should be in an ambulance if you have large ketones and you are feeling unwell). Take extra short acting insulin immediately. Discuss the dose you will need with your doctor or diabetes nurse (or follow your plan). Take your normal insulin also if it is due. Drink plenty of unsweetened fluids.

Test often until the ketones are cleared, whatever your ketone level – test your blood glucose and ketone levels every 1–2 hours until you are sure the ketones have cleared. You may need to take additional doses of short acting insulin to achieve this. Your doctor or diabetes nurse can help you with this (have a plan!).

More on managing and avoiding ketones in *diabetes* magazine in Autumn 2006. 

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