

Diabetic ketoacidosis (DKA)

Diabetic ketoacidosis (DKA) is a dangerous and potentially life-threatening condition with thousands of preventable cases each year.

DKA most commonly happens in people with Type 1 diabetes, although it occasionally occurs in people with insulin-treated Type 2 diabetes. DKA happens when there is persistently high glucose in the blood and a lack of insulin.

There are two main stages of DKA:

Stage one

As the amount of glucose in the blood rises, the body tries to remove the excess by passing it out in the urine. This leads to dehydration, as the body moves water from cells to the bloodstream to dilute the glucose. As this happens, levels of sodium and potassium (called electrolytes) are affected too. When these are unbalanced, you become even more poorly.

Even though there is a lot of glucose in the blood, the lack of insulin means it can't get to the cells where it is needed for energy. The cells send out emergency signals and the body breaks down fat stores as replacement energy. As fat is broken down, poisonous acidic chemicals, called ketones, are released into the bloodstream.

Potential symptoms of stage one

- blood glucose levels higher than 13.9mmol/l
- going to the toilet a lot to pass urine
- thirst
- tiredness
- small amounts of ketones in the blood (0.6–1.5mmol/l) or urine.

If DKA is detected at stage one, with only small amounts of ketones in the body, it may be possible to bring things back to normal by taking extra short-acting insulin – your healthcare team will tell you how.

If you have Type 1 diabetes and you are pregnant, it is even more important DKA that does not progress, so seek medical advice straight away. You will probably be admitted to hospital to ensure the safety of both yourself and your baby.

Stage two

As DKA progresses into its second stage, the amount of ketones in your blood rises. Ketones are poisonous and the body tries to remove them in the urine and on the breath. Higher levels of ketones in the blood can make you feel sick and can lead to vomiting. If untreated, high levels of ketones, dehydration and an imbalance of other chemicals in the blood can lead to unconsciousness and can eventually be fatal.

Potential symptoms of stage two

- moderate to large amounts of ketones in the blood (over 1.5mmol/l) or urine
- nausea and vomiting
- deep rapid breathing
- breath smelling of pear drops
- drowsiness
- unconsciousness.

If any of this happens, you will need immediate medical attention – usually being given fluids intravenously, and extra insulin to bring your blood glucose levels back under control. DKA can take up to 24 hours to develop in adults but develops faster in children.

It is important to get medical advice as soon as you think you may be developing DKA. Remember, at this stage DKA is a medical emergency and you should not try to treat it yourself.

Preventing DKA – blood ketone testing

If you have Type 1 diabetes, it is important to test for ketones if your blood glucose levels are persistently over 13.9mmol/l, or when you are ill. Some people do this by dipping a test strip into their urine, but others test for blood ketones using a meter.

What are the pros of testing for blood ketones?

- It gives you a here-and-now result, which means you can take action to bring your diabetes under control. The ketones in your urine were in your blood several hours ago.
- It provides a numerical result rather than a colour comparison, which can be more accurate and

How to interpret your blood ketone results

<0.6

Under 0.6mmol/l – normal; consider rechecking blood ketone levels in 1–2 hours if blood glucose remains elevated, above 13.9mmol/l.

0.6–1.5

0.6–1.5mmol/l – indicates need for extra insulin. It is important to call, or follow the rules provided by, your diabetes healthcare team and continue to check your blood glucose and blood ketone levels in 1–2 hours.

>1.5

Over 1.5mmol/l – indicates risk of diabetic ketoacidosis. Call your healthcare team immediately.

Illness

Some types of illness can affect your diabetes control by raising your blood glucose levels. When you are ill, your body reacts by releasing more glucose into the bloodstream and increases insulin resistance, stopping it from working properly. This happens even if you are eating less food than usual or vomiting.

In someone without diabetes who is ill, the body simply releases more insulin to deal with the higher levels of glucose in the blood, bringing them back within the normal limits. However, in people with diabetes this is not done, increasing the risk of developing DKA.

When you're ill

Here are the basics to remember when you're poorly:

- Test blood glucose levels more often – at least four times a day – and test during the night as well.
- If blood glucose levels are 13.9mmol/l or more, test for blood ketones.
- Continue to take insulin or diabetes medication and adjust the dose in response to test results if you have been taught to do so.
- Drink plenty of sugar-free drinks.
- If being sick, take carbohydrate-containing drinks such as milk and other milky drinks, fruit juice or sugary drinks such as Lucozade, ordinary cola or lemonade.
- Eat little and often, taking carbohydrate containing drinks, as above, and snacks such as toast, biscuits and cereal.
- Contact your doctor or healthcare team if any of the following apply: blood glucose levels are continuously high; ketones in blood or urine; vomiting; diarrhoea; or if you are unsure what to do.

easier to read. Blood testing, unlike urine testing, is unaffected by fluid intake.

- If you find urine testing distasteful, blood testing is a quick and easy alternative.

How can I test for blood ketones?

In the same way as testing for blood glucose. GlucoMen LX PLUS is the only no coding blood glucose and blood ketone meter available. Only a tiny sample is needed and your accurate results are displayed in seconds. The other meter available is the Optium Xceed but this requires coding.

Who is it most useful for?

- people with Type 1 diabetes
- children, who are more likely to develop DKA quickly and who it might be difficult to collect urine from
- insulin pumpers, as DKA can develop rapidly if the pump fails
- pregnant women, who can also develop DKA quickly, which can seriously affect both their own health and that of their baby.

Blood ketone testing doesn't replace blood glucose testing – it can be used alongside it. If you think it could help you manage your diabetes better, talk to your healthcare team.

- For more on DKA, visit www.diabetes.org.uk/dka.
- If you would like to know more about testing blood glucose and blood ketones, visit www.glucomen.co.uk, call GlucoMen on 0800 243667 or email myglucomen@menarinidiag.co.uk. You may also be able to receive a GlucoMen LX PLUS free of charge.