



Ketones & diabetes; Reduce your risk!



Booklet includes Sick Day Wallet Card

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Ketones 101

Do I really need to know this?

by Helen Jones RN, MSN, CSE

YES! The word ‘Ketone’ is important for you to know if you have diabetes! For people with type 1 diabetes and people with type 2 diabetes (during periods of illness) knowing about ketones may save your life! So read on...

Ketones (key-tones) are made when the body breaks down fat to use for energy. This happens when carbohydrates (which turn into sugar) are not available to use. You must burn fat for energy instead of sugar. Using fat for energy and making ketones may be a good thing. It is a normal and healthy process (called ketosis) that we need when we are in situations where we cannot eat. If you are fasting (for a religious holiday or you are stranded in the wilds), you need to be able to use stored fat for food. However, this process must be regulated by enough insulin.

Runaway ketones... The problem with ketones happens when you do not have enough insulin to regulate ketone production properly. Either you are truly starving for lack of food or you do not have enough insulin in your body for some reason. Having too many ketones, too quickly, is bad news. It upsets the delicate balance of body chemistry and can lead to a state called diabetic ketoacidosis (DKA) – and that is dangerous. The good news is that you can usually prevent this from happening!

Learn the 3 R’s

Risk, Recognize and React!

Risk

Know when you may be at risk for ketoacidosis

- The first risk situation for all persons with diabetes is a period where you are ill with an infection or acute illness. The stress hormones made to fight the infection will trigger the ketosis process. People with type 1 diabetes are particularly at risk here. People with type 2 diabetes usually have enough insulin to cope with an illness situation, but they may also develop ketoacidosis if the stress of an acute illness or infection overwhelms their ability to produce insulin.
- The second risk situation is when insulin has been omitted for several hours in persons with type 1 diabetes. You may have forgotten an insulin injection or insulin pump delivery was interrupted. Even a few (e.g. 4-5) hours may be enough time for ketosis to start. Check for ketones and then react appropriately. (Note: exercising when excess ketones are present will not lower the blood sugar. You need insulin first.)

Recognize

Identify the signs and symptoms of early ketosis before it becomes DKA.

Because there is little insulin, the blood sugar is usually also high.

There will usually be:

- Excessive thirst & urination – and dehydration
- Nausea or Vomiting
- Recurring vomiting and/or abdominal pain
- “fruity” smelling breath

As the ketone level rises, the blood becomes more acid. Dehydration combined with the acidic blood causes the condition called ketoacidosis or DKA.

The best way to know if ketones are above normal levels is to check the blood or urine ketone level and not wait for the symptoms to appear. Blood testing for ketones is more accurate and reliable than urine ketone testing. The ability to test for blood ketones is relatively new, and only one blood meter is able to perform this test (Precision Xtra™ by Abbott Diabetes Care). Blood ketone testing may be preferred over urine testing if it is available to you.

While urine ketone tests can be used, they have disadvantages. The results lag hours behind actual blood values; results can be false because of interfering substances (e.g., Vitamin C and Captopril); they do not detect the most important ketone product, only the weakest one. Blood ketone tests can give you much more accurate information.

React!

Recommendations for testing are intended to help you recognize early signs or symptoms and treat them early!

Prevent DKA and avoid a trip to the Emergency Department! All people with diabetes, especially those with type 1 diabetes, should know to test their blood/urine ketones when:

- They are sick with an infection or flu.
- They are under severe stress, either emotionally or physically.
- Their pre-meal blood sugar is over 14.0 mmol/L, without a known reason, or as your doctor has recommended.
- If you have any of the symptoms of ketoacidosis.

If you do become ill, follow these Sick Day Management guidelines.

- Always take your insulin or other diabetes medication – even when you are unable to eat as usual. You may need to take more insulin. But do not omit doses, even if you are not eating as usual.
- Check your blood sugars and ketone levels every 2 to 4 hours around the clock. If blood ketones are >0.6 or urine ketones are moderate to large, follow your sick day guidelines for adjusting insulin. Call your health care provider if you need help.
- If your pre-meal sugars are high (e.g. >14.0) and you have excess ketones, you will need more insulin. Call your health professional for advice or follow your dose adjustment guidelines.
- Call your doctor or go to the emergency room if you are vomiting or have blood ketones >3.0 mmol/L.
- If you are unable to eat, drink sugar- containing fluids to replace food with fluids. Try to take in 10 grams of carbohydrate every hour – e.g. 1/2 cup regular pop, 1/3 cup apple juice, 1/4 cup regular jello or sherbet

An ounce of prevention is worth a pound of cure – especially when it comes to DKA. If your blood sugars are generally in good control, ketosis should be a rare thing, but remember the 3 R's of ketones- know your risk, recognize early symptoms and react quickly.

This is your Sick Day Wallet Card. Detach it from this booklet and keep it in your wallet for easy reference.

Fold card here →

Diabetes Management **For People Who Use Insulin**

Developed at the Leadership Sinai Centre for Diabetes, Mt. Sinai Hospital, Toronto, with an educational grant from Abbott Laboratories, Limited, MediSense Products.

Know what to do **if you are sick?**

- ***Always take some insulin—never omit it! (even if vomiting)***
You always need to take some insulin—you may need extra insulin. You may have higher blood sugar levels, even though you eat less.
- ***Check your blood sugar and ketone.***
Test blood sugar and ketone before meals, and/or every 4 hours, around the clock.
If your blood ketone are > 0.7 mmol/L, call your healthcare professional and follow your Sick Day Guidelines.
- ***Drink plenty of fluids.***
Your body needs about 9 cups (2200 ml) of fluid daily to prevent dehydration. If you cannot eat as usual, replace carbohydrate with sugar-containing fluids.
- ***If you vomit twice or more within 12 hours,***
Call your healthcare professional or go to Emergency Department.

This general information about sick day management is not meant to replace the advice of your healthcare professional. Should you require further information regarding your condition or treatment, please speak with your healthcare professional.

Insulin Dose Adjustment Guidelines

The Total Daily Dose (TDD) formula helps you decide how much extra rapid or fast acting insulin you need to take.

1. Add up the number of units of insulin (all kinds) you usually take each day. (Use baseline or usual doses.) *Your TDD = _____ units.*
2. Calculate 10% = _____ 15% = _____ 20% = _____ of TDD. This is the extra dose (or supplement).
3. Follow the chart to decide how much fast/rapid acting insulin to take every 4 hours, in addition to your baseline or usual insulin doses. Repeat insulin every 4 hours, if needed, as per chart.
4. If not eating as usual, replace the usual carbohydrate with sugar containing fluids.

Your blood SUGAR tests (mmol/L)	Your blood KETONE tests (mmol/L)	ACTION NEEDED *Able to take fluids	YOUR DOSE would be:
Blood Sugar <3.9	–	No extra insulin. Decrease dose of pre-meal insulin as directed. If vomiting, contact your healthcare team!	
Blood Sugar 4.0-16.0	Blood Ketone <0.6	Use usual insulin dose (and scale) as for non-sick days.	
Blood Sugar 4.0-16.0	Blood Ketone ≥0.6	Take a 10% (of TDD) supplement of rapid or fast-acting insulin, in addition to usual <u>baseline</u> insulin doses.	
Blood Sugar >16.0	Blood Ketone <0.6	Take a 10% (of TDD) supplement of rapid or fast-acting insulin, in addition to usual <u>baseline</u> insulin doses.	
Blood Sugar >16.0	Blood Ketone ≥0.7-1.4	Take a 15% (of TDD) supplement of rapid or fast-acting insulin, in addition to usual <u>baseline</u> insulin doses.	
Blood Sugar >16.0	Blood Ketone ≥0.5-3.0	Take a 20% (of TDD) supplement of rapid or fast-acting insulin, in addition to usual <u>baseline</u> insulin doses. CALL YOUR HEALTHCARE TEAM as soon as possible!	

Look at the difference blood ketone testing can make for one person.

Sally is a 28 yr. old with type 1 diabetes. Last year she got the flu and was vomiting. She had some urine ketone testing strips, but they showed negative. She took her insulin as recommended by her insulin scale, but her blood sugar did not go down enough. She needed to go to ER, found out she had high blood ketones and spent 18 hours receiving IV therapy and IV insulin. This year, she developed bronchitis with a fever. She now has a blood ketone testing monitor and was able to know more precisely how much more insulin she needed to take because of the blood ketone level. She took a higher insulin doses than recommended by her usual correction factor (insulin scale). This and one extra dose of insulin during the night helped her to control the diabetes until the fever subsided. No trip to the ER was necessary! Learn how to reduce your risk too.



When you monitor everyday,
you need more than an
everyday monitor.

**Precision Xtra™ is the only monitor that provides
blood glucose and blood ketone testing in one monitor.**

Easy to Use

- Two-step testing: Just insert strip and apply sample
- Three-button design allows for easy set up and review of results

Simple auto-calibration

- No code to enter
- Ensures greater accuracy by preventing use of expired strips



Precision Xtra™
More than your everyday monitor.

Precision Xtra™
Blood Glucose & Ketone Monitoring System

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