

# Ketones, Shmeetones.

By Gary Scheiner, MS, CDE

When you live with diabetes, there's a lot to do. Checking blood sugars. Counting carbs. Exercising. Not to mention all those fun-filled doctors' appointments. So the last time your physician or diabetes educator suggested ketone testing, it's completely understandable that your head was nodding but your mind was thinking "No way, Jack." But before abandoning the idea completely, there are a few things you should know.

## What's a ketone?

Unlike the bumbling cops from the old silent films (those were *keystone*, genius), ketones aren't so funny. They are acid molecules generated when we burn fat for energy. You might be asking yourself, "What's wrong with that?" Well, nothing. As long as it doesn't happen in excess, because when you flood your body with too many acids, it starts to become toxic. When combined with dehydration, it can lead to a life-threatening condition called diabetic ketoacidosis (DKA).

Why would this happen? Mainly, it happens when you're not able to get enough glucose into your cells to burn for energy, and the body relies almost exclusively on fat for energy. This can occur for a number of reasons:

- Illness and infection (which cause intense insulin resistance)
- Starvation, prolonged fasting, or a severe lack of carbohydrates in one's diet (forcing the body to find alternate fuel sources)
- A lack of insulin in the body (due to missed injections, spoiled insulin, or poor absorption)
- Insulin pump malfunctions (clogs, leaks, air pockets, cannula displacement, prolonged disconnection, failure to prime the tubing, or accidentally erasing the basal settings)

## Why Bother to Check?

Like most health problems, ketones develop in stages:

	Characteristics	Symptoms
Stage 1	Rising blood sugar (due to one of the reasons listed above)	Thirst, urination, low energy
Stage 2	Ketones in the bloodstream (ketosis)	Same as above, plus some fatigue and achiness
Stage 3	Ketones in the urine (ketonuria)	Same as above, plus more significant fatigue, headache/body aches, and possible nausea
Stage 4	Diabetic Ketoacidosis (DKA)	Same as above, plus vomiting, discomfort, confusion, dizziness, deep/labored breathing and a "fruity" smell to the breath
Stage 5	Coma	Unconscious; unable to wake up
Stage 6	Death	Cold, pale, stiff (you get the idea)

Ketones should be checked any time you experience an unexplained high blood sugar or feel ill. In many instances, you will not be ketotic. But sometimes you will. Just remember that *detecting ketones at the earliest possible stage allows you to fix the problem and avoid prolonged periods of high blood sugar, extreme discomfort, and possible progression to the next, more dangerous stage.* In most cases, ketones can be eliminated by taking extra insulin (via pen or syringe) and plenty of fluids. You should notify your doctor when ketones are present, and exercise should not be performed until the ketones clear up completely.

### Ways to check.

Everyone with diabetes who uses insulin (type-1 or type-2) should have a way to test for ketones. Ketone testing can be done by way of a urine dipstick or a fingerstick blood sample. The urine test involves peeing on a test strip (or dipping the strip in a cup of urine) and observing the color change on the strip. The blood test can be performed with special ketone test strips using the Precision Xtra meter from Abbott or NovaMax Plus meter from Nova Biomedical. It is much like performing a blood sugar test, except that a ketone measurement is given. The blood test is a better way to check for ketones, since it provides a specific numerical measurement and detects ketones hours before they appear in the urine.

“Positive” ketones are indicated by either of the following:

- +A urine test that indicates small or more ketones (>15 mg/dl)
- +A blood test that indicates the presence of  $\beta$ -Hydroxybutyrate (>0.5 mmol/l)

### Take Responsibility

Just yesterday, one of my clients, Beth, woke up with an unexpectedly high blood sugar and was feeling a little bit queasy. Before doing anything

else, she checked for ketones and found they were positive. She then realized that her long-acting insulin had been exposed to very hot weather the day before. She broke out a new vial, corrected the high reading with rapid insulin and drank a lot of water. By lunchtime, her BG was approaching normal and she was feeling more like herself.

Another client, Richard, also woke up with a very high blood sugar. He gave insulin through his pump but was still high at lunchtime. So he tried again. By mid-afternoon, he was vomiting and suffering from terrible headaches. His wife rushed him to the emergency room where he was treated for DKA. Later that night, his blood sugar was back to normal, and the next day he began to regain his energy.

DKA causes more than 80% of hospital admissions for people with insulin-dependent diabetes. Even when hospitalization is not required, exposure to ketones can wreak havoc on blood sugar control and make you feel downright miserable. Almost all of this could be avoided by checking for ketones when the situation arises, and taking appropriate action when ketones are present.

Take responsibility for checking ketones. Don't make me sick the “ketone cops” on you!

*Editor's Note: Gary Scheiner is a Certified Diabetes Educator with a private practice, Integrated Diabetes Services ([www.integrateddiabetes.com](http://www.integrateddiabetes.com)), near Philadelphia. He also serves as “Dean” of Type-1 University ([www.type1university.com](http://www.type1university.com)), a web-based school of higher learning for insulin users, offering live and prerecorded courses on a variety of topics. Gary and his staff provide diabetes management and education services via phone and the Internet for children and adults worldwide. For more information, contact [gary@integrateddiabetes.com](mailto:gary@integrateddiabetes.com), or call (877) 735-3648.*