

### Why Ketonix rather than a urine or blood test for ketones?

The traditional method of testing for the presence of ketones in our systems has been either by use of urine test strip or by means of a blood test.

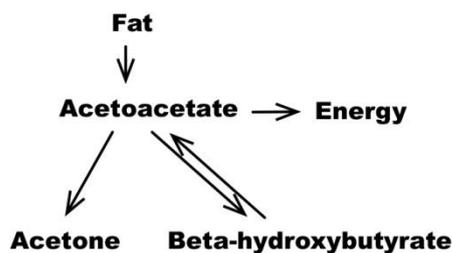
Urine strips have been notoriously inaccurate for testing nutritional ketosis because you get waste ketones in the urine and once you are using ketones efficiently there is little to no waste. Many a person has been caught out by urine testing, thinking they were not in Ketosis when in fact all that had happened is that they had become keto efficient.

Blood testing has been and is the most accurate means of testing the level of ketones in the blood at any given time but it also has problems. The first problem is the cost of the test strips which are prohibitively expensive and only allow for occasional testing and therein lies the second problem.

Blood ketone testing indicates the presence and levels of beta-hydroxybutyrate. Beta-hydroxybutyrate is one of the three ketones that the human body produces and uses and knowing the level of it in your blood is useful if you are a type 1 diabetic who is worried you may be in ketoacidosis but it's pretty meaningless for someone who is trying to stay in and optimise nutritional ketosis.

To understand this better we need to look at the ketone cycle.

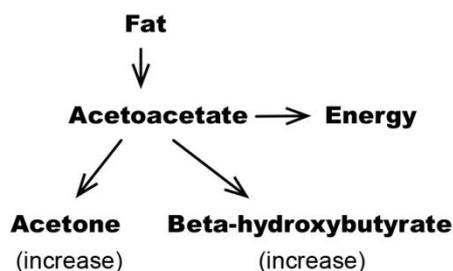
When we burn Fat our livers produce acetoacetate through a process called ketogenesis. Next the acetoacetate is converted to Acetone through acetoacetate decarboxylase and interconverts with beta-hydroxybutyrate through beta-hydroxybutyrate dehydrogenase.



When beta-hydroxybutyrate is used as energy it first converts back into acetoacetate through beta-hydroxybutyrate dehydrogenase.

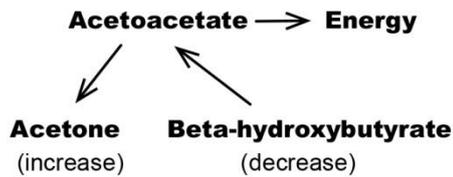
The obvious correlation is that when fatty acids are broken down in liver, acetoacetate is formed. Acetone is produced from the acetoacetate. Beta-hydroxybutyrate is formed from the excess acetoacetate.

When fat broken down the levels of both both acetone and beta-hydroxybutyrate increase. Kathy Musa-Veloso et al. Am J Clin Nutr 2002;76:65-70



So this relationship is valid your first day(s) on a low-carb ketogenic diet when you sit in your office but what happens when you actually eat some food that have to be digested? What happens when you exercise, do intermittent fasting, and do weight lifting, walking, jogging or even become fat-adapted?

Maybe fat is less available and the blood ketone concentration is relatively high what happens if your body decides to use the stored beta-hydroxybutyrate ketone energy instead of breaking down fat?



This is clearly not the nice correlation that we saw earlier but it is a valid correlation because it's another situation. The problem this raises is how do we know when the acetoacetate and beta-hydroxybutyrate interconverts?

Blood testing can't tell us this, it can only tell us that beta-hydroxybutyrate levels are dropping which we would assume means we are dropping out of ketosis but that may not be the case, the body may just have decided to use stored beta-hydroxybutyrate in place of fat and that is yet another problem. High levels of beta-hydroxybutyrate only mean that at some stage your body broke down fat, it does not mean that your body is currently breaking down fat and it certainly doesn't mean that your body is breaking down its own fat reserves.

Remember that fat Bomb you snacked on an hour ago, if you are putting lots of fat in, your body is going to break down that fat before it goes to its own reserves.

It's obvious from the above why blood testing is also a problem when it comes to nutritional ketosis but fortunately there is a solution to part of this problem.

Acetone is formed from the acetoacetate which we know is the ketone that is directly used for energy and because acetoacetate is formed either from breaking down fatty acids in the liver or from the beta-hydroxybutyrate dehydrogenase all we need to do is test the level of acetone to know our level of ketosis.

Nice theory but does it work?

Well yes it does and a study by Kathy Musa-Veloso, Sergei S Likhodii, and Stephen C Cunnane entitled "Breath acetone is a reliable indicator of ketosis in adults consuming ketogenic meals" concluded that "Breath acetone is as good a predictor of ketosis". <http://ajcn.nutrition.org/content/76/1/65.full>

Abbott laboratories who make one of the Blood testing units came to the same conclusion <http://www.clinchem.org/content/39/1/87.full.pdf>

Enter the Ketonix, the first commercially available breath acetone testing system.