

JOHN
ESSIGMANN: As I mentioned, I'm diabetic. And when things that I noticed in my dad, before he knew he was diabetic-- he'd come home from the train at night, and my sister and I would rub his legs, because they hurt. This is one of the problems with diabetics. His feet hurt. And I remember my sister Nancy saying once, gee. Daddy smells like Mommy's nail polish remover. Which was acetone. And acetone is one of the three ketone bodies, the other two being Beta-Hydroxybutyric acid and acetoacetate.

So what happens in diabetes is, the diabetic doesn't have ample carbohydrate reserves within their cells as glycogen. So they're doing a lot of fatty acid oxidation, rather than carbohydrate metabolism. If you take a fatty acid, and you break it down to Acetyl-CoA, the last step is called Beta-ketothiolase-- backs up, then your two carbons of Acetyl-CoA will be four carbons of acetoacetate.

And then acetoacetate-- a third Acetyl-CoA can add to it to form what's called hydroxy-methylglutaryl-coenzyme A-- HMG CoA. And then rearrangements can happen that give rise, ultimately, to the three ketone bodies-- acetoacetate, Beta-Hydroxybutyrate, and acetone.

So in situations where-- of starvation-- and diabetes is basically, my cells were in a technical state of starvation. In a case of starvation, what happens is you get this backup of the lipid breakdown, or catabolism pathway. And then these ketone bodies flush out into your blood.

In starvation situations, the ketone bodies will act as fuels for your brain and other organs. It's a difficult transition. But ketone bodies are-- in the case of diabetics, they're produced to excess, to such extent that they're actually quite harmful to you.

The reason a person smells of acetone is the intermediate ketone body-- the acetoacetate basically decarboxylates. It's a Beta-keto acid, and so it's a spontaneous decomposition to form acetone. Acetone is not, to my knowledge, biochemically useful as a kind of an energy source. But it's a sentinel, or it's something that is smelled, so that it can be diagnostic of the disease.