

Sweet-smelling breath to help diabetes diagnosis in children

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The potential to quickly diagnose children with type 1 diabetes before the onset of serious illness could be achieved using a simple, non-invasive breath test, according to new research published today.

In one of the most comprehensive breath-based studies of [children](#) with type 1 diabetes performed to date, a team of researchers from Oxford, UK have linked a sweet-smelling chemical marker in the breath with a build-up of potentially harmful chemicals in the blood that accumulate when insulin levels are low.

It is hoped these results—linking an increased level of breath acetone with increased levels of ketones in the blood—could inspire the development of a diagnostic device to identify children with new diabetes before the onset of diabetic ketoacidosis (DKA).

The results of the study have been published today, 26 November, in IOP Publishing's *Journal of Breath Research*.

DKA occurs when a severe lack of insulin means the body cannot use glucose for energy and starts to break down fat instead. Organic compounds called ketones are the by-product of the breakdown of fat and, if left unchecked, can build up and cause the body to become acidic.

About one in four children diagnosed with type 1 diabetes don't know they have it until they develop DKA, which can cause severe illness.

Acetone, which is the simplest ketone, is one of the by-products produced in the development of DKA and is usually disposed of through the breath. Indeed, for over 200 years acetone has been known to produce a sweet smell on the breath of diabetes sufferers.

In their study, the researchers, from the University of Oxford, Oxford Medical Diagnostics and Oxford Children's Hospital, collected the [breath samples](#) from 113 children and adolescents between the ages 7 and 18.

Isoprene and acetone were collected in breath bags and measurements were compared with capillary blood glucose and ketone levels, which were taken at the same time during a single visit to Oxford Children's Hospital.

The researchers found a significant relationship between increased levels of acetone in the breath of the subjects and increased levels of blood ketones—specifically β hydroxybutyrate.

They found no link between isoprene and acetone levels in breath and glucose levels in the blood.

Co-author of the study, Professor Gus Hancock, said: "While breath acetone has been measured in relatively large cohorts of healthy individuals, most measurements on people with type 1 diabetes have been carried out on relatively small cohorts, typically made up of less than 20 people, with relatively few measurements on children.

"Our results have shown that it is realistically possible to use measurements of breath acetone to estimate blood ketones.

"We are working on the development of a small hand held device that would allow the possibility of breath measurements for ketone levels and

help to identify children with new diabetes before DKA supervenes. Currently testing for diabetes requires a blood test which can be traumatic for children.

"Also, if the relationship between breath acetone and blood ketone levels is true at higher levels of ketones, a simple breath-test could assist with the management of sick days in children with [diabetes](#), preventing hospital admissions by providing a warning of the possible development of DKA."

More information: Comparison of breath gases, including acetone, with blood glucose and blood ketones in children and adolescents with type 1 diabetes. Tom P J Blaikie, Julie A Edge, Gus Hancock, Daniel Lunn, Clare Megson, Rob Peverall, Graham Richmond, Grant A D Ritchie and David Taylor *J. Breath Res.* 8 (2014) 046010.

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