

# Nanotechnology takes on diabetes

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(Phys.org) —A sensor which can be used to screen for diabetes in resource-poor settings has been developed by researchers and tested in diabetic patients, and will soon be field tested in sub-Saharan Africa.

A low-cost, reusable sensor which uses nanotechnology to screen for and monitor [diabetes](#) and other conditions, has been developed by an interdisciplinary team of researchers from the University of Cambridge, for use both in clinics and [home settings](#).

The sensors use nanotechnology to monitor levels of glucose, lactate and fructose in individuals with diabetes or [urinary tract infections](#), and

change colour when levels reach a certain concentration. They can be used to test compounds in samples such as urine, blood, saliva or tear fluid.

Earlier this year, [clinical trials](#) of the sensors were carried out at Addenbrooke's Hospital to monitor [glucose levels](#) in 33 diabetic patients. Recently, the team has also partnered with a non-governmental organisation to deploy the technology for field use in Ghana early next year.

According to the International Diabetes Federation, there are an estimated 175 million undiagnosed [diabetic patients](#) worldwide, 80% of whom live in low- and middle- income countries. Development of non-invasive and accurate diagnostics that are easily manufactured, robust and reusable will allow for simple monitoring of high-risk individuals in any environment, particularly in the developing world.

The sensors developed by the Cambridge team are made using laser light, which organises metal nanoparticles into alternating layers in thin gel films to produce the sensors in a matter of seconds.

When glucose, lactate or fructose concentrations are high in a sample, the sensor changes colour. The exact concentration can be determined by visually comparing the colour to a reference chart, or the image can be automatically processed by a smartphone application.

In trials conducted earlier this year in Cambridge, the sensors showed improved performance over commercial glucose test strips read by an automated reader, while showing comparable performance state-of-the-art fully-automated glucose monitoring technology. Details were recently published in the journal *Nano Letters*.

Additionally, the sensors can be produced at a fraction of the cost of

commercially-available test strips. A single sensor would cost 20 pence to produce, and can be reused up to 400 times, compared with disposable urine test strips, which cost about 10 pence per use. The use of lasers means that the sensors can be easily manufactured at scale.

"These sensors can be used to screen for diabetes in resource-poor countries, where disposable [test strips](#) and other equipment are simply not affordable," said Ali Yetisen, a PhD candidate in the Department of Chemical Engineering & Biotechnology, who led the research.

The researchers are developing a prototype smartphone-based test suitable for both clinical and home testing of diabetes and other clinically relevant conditions.

"The value of these reusable sensors will be realised when they are mass produced and adopted as a diagnostic tool for routine diabetes screening," said Yunuen Montelongo who co-authored the article.

**More information:** "Reusable, Robust, and Accurate Laser-Generated Photonic Nanosensor." Ali K. Yetisen, et al. *Nano Lett.*, Article ASAP. [DOI: 10.1021/nl5012504](https://doi.org/10.1021/nl5012504) . Publication Date (Web): May 20, 2014

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