Healthy Living

Your daily dose of health

Amperometer measures glucose levels from tears

Mark Lyall · Saturday, November 12th, 2011

There is ongoing effort to develop technologies to monitor glucose without the need of pricking your finger. Some of the technologies include, transdermal device, Raman spectroscopy through skin, fluorescent hydrogel, etc. Scientists have successfully developed an electrochemical sensor device that can measure blood sugar levels from tears instead of blood. This could save the world's 350 million diabetes patients the discomfort of pricking their fingers for droplets of blood used in traditional blood sugar tests. A report appears in ACS journal *Analytical Chemistry*.

Glucometer

A **glucometer** is a medical device for determining the approximate concentration of glucose in the blood. It is used for home blood glucose monitoring (HBGM) by people with diabetes mellitus or hypoglycemia. A small drop of blood, obtained by pricking the skin with a lancet, is placed on a disposable test strip that the meter reads and uses to calculate the blood glucose level. The meter then displays the level in mg/dl.

Problems with diabetes and glucose testing

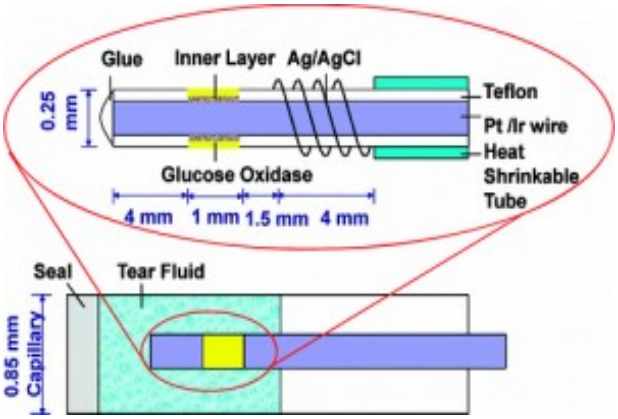
About 5% of the world's population (and about 26 million people in the U.S. alone) have diabetes. The disease is a fast-growing public health problem because of a sharp global increase in obesity, which makes people susceptible to developing type-2 diabetes. People with diabetes must monitor their blood glucose levels several times a day to make sure they are within a safe range. Current handheld glucose meters require a drop of blood, which patients draw by pricking their fingers with a small pin or lancet. However, some patients regard that pinprick as painful enough to discourage regular testing.

Measurement of tear glucose levels with amperometer

Scientists at the University of Michigan have developed an electrochemical glucometer that has shown good results comparable to traditional blood glucose testing, but uses only 4–5 µL of tears. An amperometric needle-type electrochemical

glucose sensor is deployed for tear glucose measurements in conjunction with a 0.84 mm i.d. capillary tube to collect microlitre volumes of tear fluid.

The sensor is based on immobilizing glucose oxidase on a 0.25 mm o.d. platinum/iridium (Pt/Ir) wire and anodically detecting the liberated hydrogen peroxide from the enzymatic reaction. Inner layers of Nafion and an electropolymerized film of 1,3-diaminobenzene/resorcinol greatly enhance the selectivity for glucose over potential interferences in tear fluid, including ascorbic acid and uric acid.



The new sensor is optimized to achieve very low detection limits of 1.5 ± 0.4 μM of glucose (S/N = 3) that is required to monitor glucose levels in tear fluid with a glucose sensitivity of 0.032 ± 0.02 nA/μM (n = 6). Only 4–5 μL of tear fluid in the capillary tube is required when the needle sensor is inserted into the capillary.

Tests of the approach in laboratory showed that levels of glucose in tears track the amounts of glucose in the blood. “Thus, it may be possible to measure tear glucose levels multiple times per day to monitor blood glucose changes without the potential pain from the repeated invasive blood drawing method,” say the researchers.

This technology is an effort to reduce pain out of diabetic patients from pricking their fingers. Are you thinking would you rather cry by pricking your finger or to product tear to perform this tear test?

Healthy Monitoring!

Via

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