# Adapting personal glucose monitors to detect DNA

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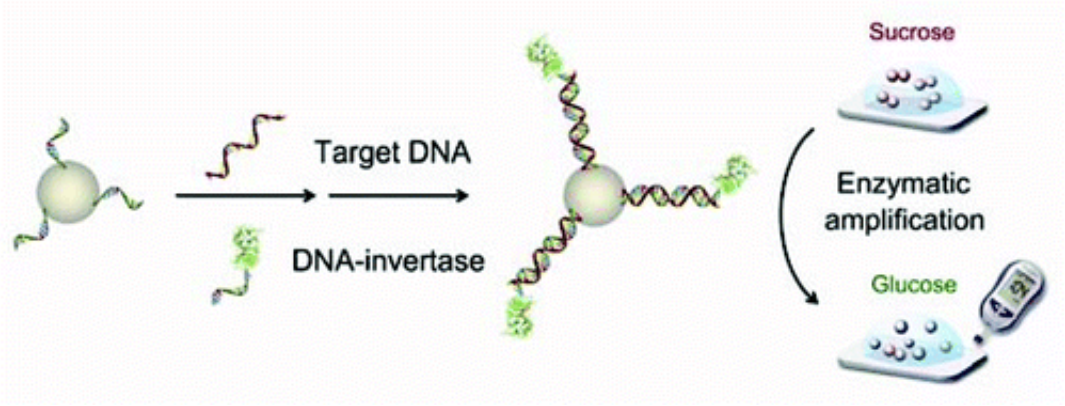


An inexpensive device used by millions of people with diabetes could be adapted into a home DNA detector that enables individuals to perform home tests for viruses and bacteria in human body fluids, in food and in other substances, scientists are reporting in a new study. The report on this adaptation of the ubiquitous personal glucose monitor, typically used to test blood sugar levels, appears in ACS' journal *Analytical Chemistry*.

Yi Lu and Yu Xiang point out that developing low-cost tests for the public to use for early diagnosis of diseases, checking the safety of food and other testing that now take days and sophisticated laboratory instruments is one of the greatest challenges in chemistry. Such tests could improve health and reduce costs, especially for people in

developing countries or rural areas in developed countries with scant medical resources. Lu and Xiang have been responding to this challenge with adaptations to the home glucose monitor, an essential device for millions of people with diabetes that's inexpensive and simple to use.

In their latest research, the scientists describe how they adapted a glucose meter to monitor DNA. Their test takes place in a liquid containing sucrose (a sugar that isn't detected by glucose meters). First, a bacterial or viral DNA fragment is captured and concentrated on beads. Then, the researchers add an enzyme that is stuck to a different DNA (which can bind to the bacterial or viral DNA). The enzyme, called invertase, turns the sucrose into glucose, which the glucose meter can measure. They detected a hepatitis B virus DNA fragment at concentrations comparable to or in some cases even better than many current DNA measurement systems, which are much more expensive and time-consuming.

**More information:** Using Commercially Available Personal Glucose Meters for Portable Quantification of DNA, *Anal. Chem.*, 2012, 84 (4), pp 1975–1980. DOI: 10.1021/ac203014s

**Abstract**
DNA detection is commonly used in molecular biology, pathogen analysis, genetic disorder diagnosis, and forensic tests. While traditional methods for DNA detection such as polymerase chain reaction (PCR) and DNA microarrays have been well developed, they require sophisticated equipment and operations, and thus it is still challenging to develop a portable and quantitative DNA detection method for the public use at home or in the field. Although many other techniques and devices have been reported to make the DNA detection simple and portable, very few of them are currently accessible to the public for quantitative DNA detection because of either the requirement of laboratory-based instrument or lack of quantitative detection. Herein we

report application of personal glucose meters (PGMs), which are widely available, low cost, and simple to use, for quantitative detection of DNA, including a hepatitis B virus DNA fragment. The quantification is based on target-dependent binding of cDNA-invertase conjugate with the analyte DNA, thereby transforming the concentration of DNA in the sample into glucose through invertase-catalyzed hydrolysis of sucrose. Instead of amplifying DNA strands through PCR, which is vulnerable to contaminations commonly encountered for home and field usage, we demonstrate here signal amplifications based on enzymatic turnovers, making it possible to detect 40 pM DNA using PGM that can detect glucose only at the mM level. The method also shows excellent selectivity toward single nucleotide mismatches.

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