LEMELSON-MIT

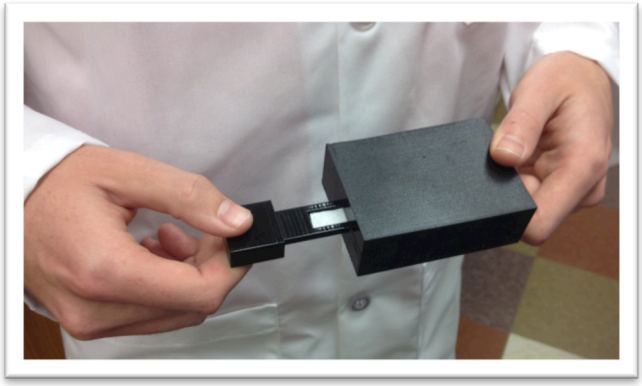
Celebrating invention, inspiring youth

Lemelson-MIT National Collegiate Student Prize Competition "Cure it!" Winner

Tyler Ovington (Team lead), Clemson University (Clemson, SC)
$10,000 Lemelson-MIT "Cure it!" Undergraduate Team Winner

GlucoSense: A low-cost glucometer and strip system for diabetics in resource-poor settings

The Challenge: Diabetes is an incurable disease that affects nearly 350 million people worldwide. Eighty percent of diabetes deaths occur in lower income countries[1]. The monitoring supplies necessary for patients to manage their disease are not readily available in these resource-poor settings or are too expensive for patients to afford. Clinics receive donations of glucose monitoring devices, but they are often incompatible with the brand of test strips donated, rendering both essentially useless.



The Solution: Tyler Ovington and team members, Alex Devon and Kayla Gainey believe that the use of inkjet printing will drastically lower the cost of test strips (1/100th of the cost of standard strips), making it possible for diabetics in resource-poor settings to properly manage their disease. The team's system has two parts: The InkJet Printed Glucose Test Strips and the Glucometer.

The Clemson Bioengineering team's glucose test strips are created using coffee filter paper, contact paper and standard ink-jet printers. The printer cartridge is filled with enzymes instead of ink, and the printer settings are controlled to deposit the appropriate volume of enzymes on the paper. Once the paper is printed, it is cut into strips to be read by the glucometer.

The glucometer uses standard photodiodes and LEDs to measure changes in strip color. A tray receives the strip and is then pushed to an inside locked position, where it aligns the test strip with the LED and photodiode to take the reading and display the patients' blood sugar on. The output of the photodiodes is read and processed to produce an amplified absorbance reading. The equation relating absorbance readings and glucose levels is obtained from a standard calibration curve. The output of the amplifier is read and assessed by a microcontroller and displayed on the LCD screen.

Application and Commercialization: The simplicity of the test strip manufacturing process and usability of the glucometer allow for local manufacturing and reduced costs. A reduction in logistical problems associated with purchasing and distributing diabetic test materials from other countries is also anticipated. The team, with the support of the Clemson Creative Inquiry Program, is currently focusing efforts and testing on quality control measures using glucose standard solutions to advance their work further. Under the mentorship of advisors Dr. Delphine Dean and Dr. John DesJardins, the team is also piloting the technology at Muhimbili Hospital in Tanzania with plans to partner with local technicians, hospitals, clinics, and the Tanzanian Diabetes Association to produce and distribute the technology.

[1] http://www.who.int/mediacentre/factsheets/fs312/en/