A Technology Assisted Ketone Detecting Patch for the Noninvasive Detection of Type 1 Diabetes

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Undiagnosed type 1 diabetes can cause death if left untreated. Current detection methods utilize urine or blood, both of which are invasive to obtain, especially considering the young demographic that is typically diagnosed with the disease. However, undiagnosed type 1 diabetics also produce ketones as a byproduct of fat metabolism, which are excreted in sweat. The purpose of this project is to improve the student researcher’s ketone-detecting sweat patch by quantifying the ketone concentration. This was done by monitoring color change in the patch utilizing a smartphone colorimeter and monitoring the hue, saturation, and lightness (HSL) value difference between the patch and a water-soaked control. For preliminary testing, 0, 0.5, and 3 mM ethyl acetoacetate were used to simulate the presence of ketone bodies. For human testing, the patch was tested on runners that had just completed a run of at least 13 miles (a condition that is likely to produce ketones) and non-diabetics that had not engaged in vigorous activity for the past day (control group), with Ketostix (commercially available urine ketone strips) being used as a measurement control. The patch and urine strip were consistent on the presence of ketones 100% of the time, leading to zero type 1 or 2 errors, and the p-value when compared to previous research was less than 0.05.

Awards Won:
Qatar Foundation, Research &amp Development: Award of $1,000