# Using Polarized Light to Measure Blood Glucose Levels Non-invasively

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Diabetes control requires measuring blood glucose levels frequently. All FDA approved methods for monitoring blood glucose concentrations are invasive (i.e. require skin penetration or fluid extraction). This project investigated a novel method of non-invasive blood glucose measurement. Polarized light rotates when transmitted through a glucose solution, with the angle of rotation dependent in part on the sugar concentration. This rotation could, in principle, be used to measure blood glucose concentrations non-invasively by determining the angle of rotation of polarized light transmitted through blood perfused tissue. This project simulated human blood glucose measurements in vivo using solutions of glucose and myoglobin (an animal-derived analogue of human hemoglobin), measured with polarized laser light transmitted through the solutions and a layer of simulated human tissue (animal-derived epidermis). A measuring device consisting of a 650nm laser, two adjustable polarizing filters, transmission paths through the tissue and blood simulants, and a device for measuring and recording polarized light intensity was created and used to measure the degree of optical rotation caused by varying glucose concentrations, with and without the interfering tissue samples. Mean angular rotations ranged from 1.9 to 10.5 degrees, increasing linearly with glucose concentration. Two sample T-tests indicated that rotations were not statistically different when tissue was present. The experiment demonstrated that polarized light can be used successfully to measure glucose concentrations in human blood and tissue analogues. Extrapolation to greater sensitivities demonstrates that this method provides a path for further research to develop an effective non-invasive monitor.

**Awards Won:**