Methods and apparatus for creating a portable non-invasive glucose monitoring system, which includes a sensing solution containing specially-designed nanoparticles sensitive to very minute changes in glucose level.

Diabetes mellitus is the sixth-leading cause of death in the U.S. It is a medical disorder characterized by persistent variable hyperglycemia (high blood sugar levels), resulting from inadequate secretion of the hormone insulin, inadequate response by the body’s cells to insulin, or a combination of both of these factors. Over the years, high blood glucose damages nerves and blood vessels, leading to complications such as blindness, heart and kidney disease, nerve problems, gum infections, and amputation. Prevention of diabetes-related complications is accomplished through strict control of glucose levels in the blood. In the past few decades, many different glucose sensors have been developed. Current glucose sensors and methods include near-infrared spectroscopy, optical rotation, enzymatic assays, fluorescence detection, and many others. However, none of these sensors is fully non-invasive, most requiring a blood sample.

Technical Details

The current invention provides a non-invasive method of sensing glucose in bodily fluids. Such fluids include blood, saliva, urine, and tears. However, the concentration of glucose in tears correlates best with blood glucose concentration. The sensor determines glucose concentration based upon the interaction of the bodily fluids with nanoparticles and metal salts present in the sensing solution. This solution is stored in a small cell (sample container), into which the bodily fluid is introduced. The absorbance spectrum of this mixture is then measured using a UV spectrometer, which can be as small as a cell phone. The fluid's interaction with the sensing solution produces a change in the solution's absorption spectrum, which can then be correlated to the glucose levels present in the blood. This sensing solution in conjunction with an extremely small, portable detector provides a simple, low-cost and non-invasive means of monitoring glucose levels in the blood. In addition, by using this method, potential diabetic problems can be detected before diabetes has been diagnosed.

Benefits

• Non-invasive, non-painful means of monitoring glucose levels in the blood
• Reliable method requiring small samples for monitoring, such a few tears
• Low-cost portable detector

Applications

• Highly sensitive monitoring of glucose levels in the various bodily fluids

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