

Impedance Spectroscopy of Aqueous Solution Samples of Different Glucose Concentrations for the Exploration of Non-Invasive Continuous-Blood-Glucose-Monitoring

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Abstract: Continuous blood-glucose-monitoring provides maximal information about the fluctuations of blood-glucose levels throughout the day and thus plays a vital role in controlling the blood-glucose level in diabetes. The conventional methods of testing blood-glucose level are invasive, painful and are unsuitable for continuous monitoring. Thus, the battle for developing bloodless and painless blood-glucose monitors has begun from past three decades. Electrical bio-impedance spectroscopy has been suggested as one of the potential technique for the development of such monitors. The present work is aimed at impedance spectroscopy to demonstrate the variation in electrical bio-impedance properties of blood with the change in glucose concentration. Glucose-dependent electrical impedance parameters of aqueous solution samples, of increasing glucose concentration have been determined to accomplish the same. The glucose-dependent capacitance and conductance illustrates the direct variations in impedance parameters with respect to change in glucose concentration. Measurement automation program is developed to ease the measurement procedure, to support continuous measurement, and to compute short-term repeatability of measurement results. The experimental results of the present work will be used to implement electrical bio-impedance spectroscopy technique in the development of non-invasive-continuous-bloodglucose monitoring system.

Keywords: Non-invasive; Diabetes; Glucose concentration; Electrical impedance; Capacitance; Conductance