Pre-Clinical Human Validation of a Wavelength-Modulated Differential Photothermal Radiometry (WM-DPTR) Biosensor for Non-contacting and Non-Invasive Blood Glucose Monitoring

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This Project aims to upgrade the portable instrumentation and complete the calibration of our patented non-invasive Wavelength Modulation Differential Photothermal Radiometry (WM-DPTR) blood (interstitial fluid) glucose biosensor prototype, followed by lab-based and preliminary clinical volunteer testing. A new patent pending signal processing technique, Quarter-Period Software Lock-In Amplifier (QP-SLIA), invented in our lab and designed for differential multi-parameter signals like WM-DPTR, will be integrated into the system to allow for non-contact, real-time monitoring of blood / interstitial fluid glucose levels, which can be particularly beneficial for continuous glucose monitoring in diabetic patients. By separating optical and thermal components, QP-SLIA demodulation improves the sensitivity and accuracy of glucose detection, making it possible to detect subtle changes in glucose levels. The WM-DPTR biosensor

has shown strong correlations with conventional invasive (skin pricking and blood-sampling) glucometer readings, suggesting it could be a reliable alternative to traditional invasive and quasi-invasive patch-based glucose monitoring methods, if clinically validated. Preliminary QP-SLIA - coupled signals have provided insights into the kinetics of glucose diffusion, which can help in understanding how glucose levels change over time and improve localized diabetes management strategies. Ultimate goal of the Proposal is to establish WM-DPTR as a uniquely non-invasive and non-contacting, reliable, accurate and precise glucose biosensor modality superior to other state-of-the-art quasi-invasive and non-invasive methods.