Accuracy of Non-Invasive Continuous Glucose Nanosensor for ex vivo Artificial Pancreas

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Diabetes is a serious worldwide epidemic that affects a growing portion of the population. While the most common method for testing blood glucose involves finger pricking, it is painful and inconvenient for patients. This study's purpose was to measure the accuracy of a continuous glucose monitoring (CGM) nanosensor designed for interstitial fluid in artificial tear fluid, under random glucose fluctuations. Moreover, this study assessed the accuracy of the nanosensor connected to a circuit made by the researcher, relative to a commercial glucose meter, using the Clark's Error Grid Analysis (EGA). After producing a linear regression for predicting glucose levels from the voltage decay time (sec) in the CGM nanosensor, the accuracy of the non-invasive system was determined to be acceptable within the error margins. A Pearson correlation was also computed and showed a significant correlation ($p<0.001$) between the commercial glucose meter values and the predicted glucose from both the CGM nanosensor and the standard commercial glucose meter strips attached to the circuit (the control). The results did support the original hypothesis; the accuracy of the non-invasive tear glucose monitoring system is promising, as it appears acceptable using current commercial invasive CGM technology. This significant result suggests that the coupling of a non-invasive CGM system, a system that detects the glucose in tears, along with an insulin pump may be feasible as an ex-vivo artificial pancreas treatment. By employing this ex-vivo artificial pancreas, many of the complications associated with frequent hyperglycemia and hypoglycemia events can be avoided, in addition to a higher quality of life.

Awards Won:

Fourth Award of $500