

Amperometric Glucose Sensors: Sources of Error and Potential Benefit of Redundancy

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Abstract

Amperometric glucose sensors have advanced the care of patients with diabetes and are being studied to control insulin delivery in the research setting. However, at times, currently available sensors demonstrate suboptimal accuracy, which can result from calibration error, sensor drift, or lag. Inaccuracy can be particularly problematic in a closed-loop glycemic control system. In such a system, the use of two sensors allows selection of the more accurate sensor as the input to the controller. In our studies in subjects with type 1 diabetes, the accuracy of the better of two sensors significantly exceeded the accuracy of a single, randomly selected sensor. If an array with three or more sensors were available, it would likely allow even better accuracy with the use of voting.

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Abbreviations: (ARD) absolute relative difference, (NASA) National Aeronautics and Space Administration, (NIH) National Institutes of Health, (ZMAD) Z score with median absolute deviation

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