

Personalized Sweat Glucose Platform for Blood Glucose Estimation

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Non-invasive sweat glucose monitoring offers a patient-friendly alternative to finger-prick blood testing but remains limited by low glucose concentrations, temperature-dependent enzymatic responses, and inter-individual variability in sweat–blood glucose relationships. These challenges are particularly pronounced in elderly or bedridden hospitalized patients. Here, we present a personalized, temperature-controlled sweat glucose platform for non-invasive glycemic assessment in hospitalized stroke patients. The system combines a gentle agarose hydrogel patch for passive fingertip sweat collection with post-collection electrochemical measurement at 37 °C to minimize environmental and enzymatic variations while reducing skin burden. A personalized calibration model was established using paired sweat-current and reference blood glucose measurements from three healthy participants, achieving 99% of estimated blood glucose values within clinically acceptable Clarke Error Grid zones. The optimized workflow was subsequently applied to eight elderly hospitalized stroke patients under routine clinical-care conditions. These results demonstrate the feasibility of combining hydrogel-assisted sweat sampling, temperature-controlled sensing, and personalized calibration for non-invasive, trend-based glucose assessment in hospital settings.

Keywords: Sweat glucose; Electrochemical biosensor; Personalized calibration; Stroke patients.

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