

Noninvasive Monitoring of Glucose Levels: Is Exhaled Breath the Answer?

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Abstract

Monitoring of blood glucose levels is clinically important in the management of diseases affecting insulin secretion and resistance, most notably diabetes mellitus and cystic fibrosis. Typically, blood glucose monitoring is an invasive technique that may cause distress and discomfort, particularly in the pediatric population. Development of noninvasive methods of monitoring blood glucose is therefore indicated, particularly for use in children. Using respiratory fluids (the liquid present in the lumen of the airways and alveoli) to estimate blood glucose levels indirectly is one potential method. Glucose concentrations in respiratory fluids are typically low, maintained by the equilibrium between paracellular leakage of glucose from the lung interstitium and active cotransport of glucose by epithelial cells. Measurement of glucose in respiratory fluid by collection of exhaled breath condensate is therefore a potentially clinically useful method of estimating blood glucose levels if it can be shown that there is good agreement between these values. This article reviews the research in this area.

J Diabetes Sci Technol 2012;6(3):659-664

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Abbreviations: (CF) cystic fibrosis, (CFRD) cystic fibrosis-related diabetes, (DM) diabetes mellitus, (EBC) exhaled breath condensate, (ISF) interstitial fluid, (PTR-MS) proton-transfer-reaction mass spectrometry, (SIFT-MS) selected-ion flow-tube mass spectrometry, (VOCs) volatile organic compounds

Keywords: blood glucose, blood glucose self-monitoring, C-peptide, exhaled breath condensate, review

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