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Abstract

Markers of Dysmetabolism Revealed Using a Dietary Challenge and Dry Blood Spots in a Remotely Executed Clinical Trial †

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Abstract: Background and Objectives: The physiological changes that take place after the ingestion of a meal are largely controlled by insulin and can reflect changes in the response to this hormone. Different studies have reported metabolic differences among groups of subjects in the postprandial state, while failing at detecting differences in the fasted state. Dry blood spots (DBS) are a non-invasive tool for sampling and storing small volumes of biological fluids, useful in biomarker discovery studies or the analysis of responses to interventions. The aim of this study was to identify markers of dysregulated glucose postprandial metabolism in a clinical study conducted remotely, using DBS as a sampling strategy. Methods: 100 males and females (18–60 y.o., BMI: 18.5–34.9 kg/m^2) went through a dietary challenge based on the intake of an energy-dense meal (75 g glucose, 60 g canola oil and 20 g casein) and blood sampling (as DBS) at 0, 30, 60, 90, 120 and 150 min. Capillary glycaemia was monitored using a portable glucometer. DBS samples were analyzed in an untargeted metabolomic platform using gas chromatography coupled to mass spectrometry. Results: The outcomes of the study confirm the viability of the remotely executed clinical study. Performing the dietary challenges at the homes of the study subjects did not interfere with the quality of the data collected. The subjects were sorted according to glucose AUC and divided into two groups. The blood levels of markers of insulin resistance such as branched-chain amino acids and tyrosine were increased in the subjects with the larger glucose AUC. The concentration of metabolites associated with glucose metabolism (monosaccharides, lactate and Krebs cycle metabolites) were also increased is the blood of individuals with higher AUC, in comparison to those with lower AUC values. Moreover, 30 other unidentified metabolites also displayed higher concentrations in the DBS collected from individuals with larger AUC of glucose, indicating a number of compounds with marker quality that remain to be identified. Discussion: This is the first clinical study that employed DBS as a sampling strategy during a dietary challenge and successfully described a metabolic signature of glucose metabolism dysregulation.

Keywords: metabolomics; GC-MS; DBS; metabolism; postprandial

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