

A Novel Fasting Blood Test for Insulin Resistance and Prediabetes

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Abstract

Background:

Insulin resistance (IR) can precede the dysglycemic states of prediabetes and type 2 diabetes mellitus (T2DM) by a number of years and is an early marker of risk for metabolic and cardiovascular disease. There is an unmet need for a simple method to measure IR that can be used for routine screening, prospective study, risk assessment, and therapeutic monitoring. We have reported several metabolites whose fasting plasma levels correlated with insulin sensitivity. These metabolites were used in the development of a novel test for IR and prediabetes.

Methods:

Data from the Relationship between Insulin Sensitivity and Cardiovascular Disease Study were used in an iterative process of algorithm development to define the best combination of metabolites for predicting the M value derived from the hyperinsulinemic euglycemic clamp, the gold standard measure of IR. Subjects were divided into a training set and a test set for algorithm development and validation. The resulting calculated M score, M^Q , was utilized to predict IR and the risk of progressing from normal glucose tolerance to impaired glucose tolerance (IGT) over a 3 year period.

Results:

M^Q correlated with actual M values, with an r value of 0.66. In addition, the test detects IR and predicts 3 year IGT progression with areas under the curve of 0.79 and 0.70, respectively, outperforming other simple measures such as fasting insulin, fasting glucose, homeostatic model assessment of IR, or body mass index.

Conclusions:

The result, Quantose™, is a simple test for IR based on a single fasting blood sample and may have value as an early indicator of risk for the development of prediabetes and T2DM.

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Abbreviations: (α -HB) α -hydroxybutyric acid, (AUC) area under curve, (BMI) body mass index, (FPG) fasting plasma glucose, (HESI) heated electrospray ionization, (HOMA-IR) homeostatic model assessment of insulin resistance, (IGT) impaired glucose tolerance, (IR) insulin resistance, (L-GPC) linoleoylglycerophosphocholine, (NGT) normal glucose tolerance, (OGIS) oral glucose insulin sensitivity, (OGTT) oral glucose tolerance test, (QUICKI) quantitative insulin sensitivity check index, (RISC) Relationship between Insulin Sensitivity and Cardiovascular Disease, (T2DM) type 2 diabetes mellitus, (UHPLC-MS-MS) ultra-high performance liquid chromatographic tandem mass spectroscopy

Keywords: biomarkers, insulin resistance, metabolomics, prediabetes, Quantose

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