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ORIGINAL ARTICLE

A Spectrum of Dynamic Insulin Sensitivity Test Protocols

Paul D. Docherty, Ph.D.,[1] J. Geoffrey Chase, Ph.D.,[1] Lisa Te Morenga, Ph.D.,[2] Thomas F. Lotz, Ph.D.,[1]
Juliet E. Berkeley, M.B.Ch.B.,[3] Geoffrey M. Shaw, M.B.Ch.B., FJFICM,[3]
Kirsten A. McAuley, M.B.Ch.B., Ph.D.,[2] and Jim I. Mann, M.B.Ch.B., Ph.D., FRACP[2]

Abstract

Background:

Numerous tests have been developed to estimate insulin sensitivity (*SI*). However, most of the established tests are either too expensive for widespread application or do not yield reliable results. The dynamic insulin sensitivity and secretion test (DISST) uses assays of glucose, insulin, and C-peptide from nine samples to quantify *SI* and endogenous insulin secretion (U_N) at a comparatively low cost. The quick dynamic insulin sensitivity test has shown that the DISST *SI* values are robust to significant assay omissions.

Methods:

Eight DISST-based variations of the nine-sample assay regimen are proposed to investigate the effects of assay omission within the DISST-based framework. *SI* and U_N were identified using the fully-sampled DISST and data from 218 nine-sample tests undertaken in 74 female individuals with elevated diabetes risk. This same data was then used with appropriate assay omissions to identify *SI* and U_N with the eight DISST-based assay variations.

Results:

Median intraprocedure proportional difference between *SI* values from fully-sampled DISST and the DISST-based variants was in the range of -17.9 to 7.8%. Correlations were in the range of r = 0.71 to 0.92 with the highest correlations between variants with the greatest commonality with the nine-sample DISST. Metrics of U_N correlated relatively well between tests when C-peptide was assayed (r = 0.72 to 1) but were sometimes not well estimated when samples were not assayed for C-peptide (r = -0.14 to 0.75).

Conclusions:

The DISST-based spectrum offers a series of tests with very distinct compromises of information yield, accuracy, assay cost, and clinical intensity. Thus, the spectrum of tests has the potential to enable researchers to better allocate funds by selecting an optimal test configuration for their particular application.

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Author Affiliations: [1]Department of Mechanical Engineering, University of Canterbury, Christchurch, New Zealand; [2]Edgar National Centre for Diabetes Research, University of Otago, Dunedin, New Zealand; and [3]Christchurch School of Medicine, University of Otago, Christchurch, New Zealand

Abbreviations: (DC) deconvolution, (DISST) dynamic insulin sensitivity and secretion test, (DISTq) quick dynamic insulin sensitivity test, (E_{DISTq}) DISTq identification methods, (HOMA) homeostasis model assessment, (IIM) iterative integral method, (LBM) lean body mass, (*SI*) insulin sensitivity, (U_1) first phase insulin production, (U_2) second phase insulin production, (U_B) basal insulin production, (U_N) endogenous insulin production, (V_G) glucose distribution volume

Keywords: dynamic insulin sensitivity tests, insulin resistance screening, insulin sensitivity, physiological modeling, prediabetes

Corresponding Author: Paul D. Docherty, B.E., Department of Mechanical Engineering, University of Canterbury, New Zealand, Private Bag 4800, Christchurch 8140, New Zealand; email address paul.docherty@canterbury.ac.nz