Changes in plasma metabolome during the postprandial period reveal early markers of disease in postmenopausal women

Carlos Mario Donado Pestana[1], Amanda Vasconcelos[1], Vinícius Mantovam[1], Larissa Rodrigues[1], Tushar More[2], Karsten Hiller[2], Jarlei Fiamoncini[1]

[1.] USP, Universidade de São Paulo, Av. Prof. Lineu Prestes, 580, Bloco 14, São Paulo, SP, Brasil. CEP 05508-900;
[2.] TU Braunschweig, Technical University of Braunschweig, Braunschweig. P. O. Box: 38092 Braunschweig, Germany;

Menopause induces physiological alterations predisposing women to the development of diseases associated with dysregulation of energy metabolism. The evaluation of postprandial responses allows for a comprehensive assessment of metabolism and the identification of biomarkers of chronic diseases. By applying a dietary challenge (blood sampling during a 6-h period following the intake of a chemically defined meal), we investigated postprandial metabolism in postmenopausal women (PM; n=20) and women of reproductive age (RA; n=20). A gas chromatography-mass spectrometry-based metabolite profiling was conducted in plasma samples to assess metabolic alterations during the postprandial period. PM display higher postprandial plasma levels of sugars and sugar-derived products such as glucose, fructose, mannose, myo-inositol, and glycerol-3-phosphate. Postprandial markers of lipid metabolism were also different between both groups: plasma levels of cholesterol, glycerol, and palmitic acid were higher in PM. Furthermore, postprandial plasma levels of branched-chain (leucine, isoleucine, and valine) and aromatic amino acids (phenylalanine) were higher in PM in comparison to RA, as well as the levels of alanine and glycine. The metabolites here described with higher plasma levels in PM have been previously recognized as markers of obesity and insulin resistance. Most of the postprandial differences in plasma metabolome can be linked to insulin effects on uptake and utilization of glucose, fatty acids, and amino acids with the alterations in plasma levels given as signatures of impaired insulin response in PM. The dietary challenge triggers changes in plasma levels of metabolic intermediates, revealing potential problems in the regulation of metabolism that might not be noticeable in the fasted state. Therefore, its application for the identification of early markers of disease is encouraged and deserves further investigation.

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