

**International Textbook of Diabetes Mellitus, 4th Ed., Chapter 18 -
Metabolomics: applications in type 2 diabetes mellitus and insulin resistance**

References:

1. McGarry JD: What if Minkowski had been ageusic? An alternative angle on diabetes. *Science* 1992;258(5083):766–770.
2. McGarry JD: Banting lecture 2001: dysregulation of fatty acid metabolism in the etiology of type 2 diabetes. *Diabetes* 2002; 51(1):7–18.
3. Friedrich N: Metabolomics in diabetes research. *Journal of Endocrinology* 2012;215(1):29–42.
4. Gjesing AP, Pedersen O: 'Omics'-driven discoveries in prevention and treatment of type 2 diabetes. *European Journal of Clinical Investigation* 2012;42(6):579–588.
5. Lu J, Xie G, Jia W: Metabolomics in human type 2 diabetes research. *Frontiers of Medicine* 2013;7(1):4–13.
6. van der Greef J, Smilde AK: Symbiosis of chemometrics and metabolomics: past, present, and future. *Journal of Chemometrics* 2005;19(5–7):376–386.
7. Wilcken B, Wiley V, Hammond J, Carpenter K: Screening newborns for inborn errors of metabolism by tandem mass spectrometry. *New England Journal of Medicine* 2003;348(23):2304–2312.
8. Ozben T: Expanded newborn screening and confirmatory follow-up testing for inborn errors of metabolism detected by tandem mass spectrometry. *Clinical Chemistry and Laboratory Medicine* 2013;51(1):157.
9. Blasco H, Corcia P, Pradat PF, et al.: Metabolomics in cerebrospinal fluid of patients with amyotrophic lateral sclerosis: an untargeted approach via high-resolution mass spectrometry. *Journal of Proteome Research* 2013;12(8):3746–3754.
10. Wishart DS, Tzur D, Knox C, et al.: HMDB: the Human Metabolome Database. *Nucleic Acids Research* 2007;35(Database issue): D521–6. doi:10.1093/nar/gkl923. PMC 1899095. PMID 17202168.
11. Xia J, Broadhurst DI, Wilson M, Wishart DS: Translational biomarker discovery in clinical metabolomics: an introductory tutorial. *Metabolomics* 2013;9(2):280–299.
12. Benjamini Y, Hochberg Y: Controlling false discovery rate: a practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society, Series B (Methodological)* 1995;57:289–300.
13. Salek RM, Maguire ML, Bentley E, et al.: A metabolomic comparison of urinary changes in type 2 diabetes in mouse, rat, and human. *Physiological Genomics* 2007;29(2):99–108.
14. Adams SH, Hoppel CL, Lok KH, et al.: Plasma acylcarnitine profiles suggest incomplete long-chain fatty acid beta-oxidation and altered tricarboxylic acid cycle activity in type 2 diabetic African-American women. *Journal of Nutrition* 2009;139(6):1073–1081.
15. Mihalik SJ, Goodpaster BH, Kelley DE, et al.: Increased levels of plasma acylcarnitines in obesity and type 2 diabetes and identification of a marker of glucolipotoxicity. *Obesity (Silver Spring)* 2010;18(9):1695–1700.
16. Suhre K, Meisinger C, Doring A, et al.: Metabolic footprint of diabetes: a multiplatform metabolomics study in an epidemiological setting. *PLoS One* 2010;5(11):e13953.

17. Huffman KM, Shah SH, Stevens RD, et al.: Relationships between circulating metabolic intermediates and insulin action in overweight to obese, inactive men and women. *Diabetes Care* 2009; 32(9):1678–1683.
18. Zhao X, Fritsche J, Wang J, et al.: Metabonomic fingerprints of fasting plasma and spot urine reveal human pre-diabetic metabolic traits. *Metabolomics* 2010;6(3):362–374.
19. Fiehn O, Garvey WT, Newman JW, et al.: Plasma metabolomic profiles reflective of glucose homeostasis in non-diabetic and type 2 diabetic obese African-American women. *PLoS One* 2010; 5(12):e15234.
20. Gall WE, Beebe K, Lawton KA, et al.: Alpha-hydroxybutyrate is an early biomarker of insulin resistance and glucose intolerance in a nondiabetic population. *PLoS One* 2010;5(5):e10883.
21. Tai ES, Tan ML, Stevens RD, et al.: Insulin resistance is associated with a metabolic profile of altered protein metabolism in Chinese and Asian-Indian men. *Diabetologia* 2010;53(4):757–767.
22. LaFerrere B, Reilly D, Arias S, et al.: Differential metabolic impact of gastric bypass surgery versus dietary intervention in obese diabetic subjects despite identical weight loss. *Science Translational Medicine* 2011;3(80):80re2.
23. Wang TJ, Larson MG, Vasan RS, et al.: Metabolite profiles and the risk of developing diabetes. *Nature Medicine* 2011;17(4):448–453.
24. Cheng S, Rhee EP, Larson MG, et al.: Metabolite profiling identifies pathways associated with metabolic risk in humans. *Circulation* 2012;125(18):2222–2231.
25. Wang-Sattler R, Yu Z, Herder C, et al.: Novel biomarkers for pre-diabetes identified by metabolomics. *Molecular Systems Biology* 2012;8:615.
26. Wurtz P, Makinen VP, Soininen P, et al.: Metabolic signatures of insulin resistance in 7,098 young adults. *Diabetes* 2012;61(6): 1372–1380.
27. Wurtz P, Tiainen M, Makinen VP, et al.: Circulating metabolite predictors of glycemia in middle-aged men and women. *Diabetes Care* 2012;35(8):1749–1756.
28. Koves TR, Ussher JR, Noland RC, et al.: Mitochondrial overload and incomplete fatty acid oxidation contribute to skeletal muscle insulin resistance. *Cell Metabolism* 2008;7(1):45–56.
29. Muoio DM, Newgard CB: Mechanisms of disease: molecular and metabolic mechanisms of insulin resistance and beta-cell failure in type 2 diabetes. *Nature Reviews Molecular Cell Biology* 2008;9(3):193–205.
30. Felig P, Marliss E, Cahill GFJ: Plasma amino acid levels and insulin secretion in obesity. *New England Journal of Medicine* 1969; 281(15):811–816.
31. Newgard CB, An J, Bain JR, et al.: A branched-chain amino acid-related metabolic signature that differentiates obese and lean humans and contributes to insulin resistance. *Cell Metabolism* 2009;9(4):311–326.
32. Adams SH: Emerging perspectives on essential amino acid metabolism in obesity and the insulin-resistant state. *Advances in Nutrition* 2011;2(6):445–456.
33. Shaham O, Wei R, Wang TJ, et al.: Metabolic profiling of the human response to a glucose challenge reveals distinct axes of insulin sensitivity. *Molecular Systems Biology* 2008;4:214.
34. She P, Van Horn C, Reid T, et al.: Obesity-related elevations in plasma leucine are associated with alterations in enzymes involved in branched-chain amino acid metabolism. *American Journal of Physiology—Endocrinology and Metabolism* 2007; 293(6): E1552–1563.
35. Lackey DE, Lynch CJ, Olson KC, et al.: Regulation of adipose branched-chain amino acid catabolism enzyme expression and cross-adipose amino acid flux in

- human obesity. *American Journal of Physiology—Endocrinology and Metabolism* 2013; 304(11):E1175–1187.
36. Wang TJ, Ngo D, Psychogios N, et al.: 2-Aminoadipic acid is a biomarker for diabetes risk. *Journal of Clinical Investigation* 2013;123(10):4309–4317.
 37. Floegel A, Stefan N, Yu Z, et al.: Identification of serum metabolites associated with risk of type 2 diabetes using a targeted metabolomic approach. *Diabetes* 2013;62(2):639–648.
 38. Campbell C, Grapov D, Fiehn O, et al.: Improved metabolic health alters host metabolism in parallel with changes in systemic xeno-metabolites of gut origin. *PLoS One* 2014;9(1):e84260.
 39. Le Chatelier E, Nielsen T, Qin J, et al.: Richness of human gut microbiome correlates with metabolic markers. *Nature* 2013; 500(7464):541–546.
 40. Larsen N, Vogensen FK, van den Berg FW, et al.: Gut microbiota in human adults with type 2 diabetes differs from non-diabetic adults. *PLoS One* 2010;5(2):e9085.
 41. Qin J, Li Y, Cai Z, et al.: A metagenome-wide association study of gut microbiota in type 2 diabetes. *Nature* 2012;490(7418):55–60.
 42. Karlsson FH, Tremaroli V, Nookaew I, et al.: Gut metagenome in European women with normal, impaired and diabetic glucose control. *Nature* 2013;498(7452):99–103.
 43. Zhang X, Shen D, Fang Z, et al.: Human gut microbiota changes reveal the progression of glucose intolerance. *PLoS One* 2013; 8(8):e71108.
 44. Kaddurah-Daouk R, Weinshilboum RM: Pharmacometabolomics: implications for clinical pharmacology and systems pharmacology. *Clinical Pharmacology and Therapeutics* 2014;95(2):154–167.