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Targeted metabolomics facilitates discovery of novel biomarkers of early stages of diabetes type 2 and its complications: Contributions to individualized medicine

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Abstract

Many present biomarkers used for the population stratification, diagnosis or drug efficacy assessment are sensitive to late processes where the disease is overt. We explored the possibility of adding more specificity, sensitivity, robustness and detection of early disease by targeted metabolomics. We applied HPLC- or FIA-MS/MS (Biocrates AbsoluteIDQ assay) to analyze human metabolome in complex diseases like diabetes type 2. In KORA study we quantified 140 metabolites for 4297 fasting serum, which revealed three novel biomarkers glycine, lysophosphatidylcholine 18:2 and acetylcarnitine that had significantly altered levels in individuals with impaired glucose tolerance. This observation was replicated in EPIC cohort. Kidney dysfunction is a very common complication of diabetes and chronic kidney disease affect up to 10% of adult population. With targeted metabolomics we analyzed 151 metabolites in KORA cohort and replicated the study in Twins, UK cohort. Glomerular filtration rate was associated with 22 metabolites including carnitines. Early detection of pre-disease may allow for therapeutic treatment or life style adjustments to support health. Recently we discovered that sexual dimorphism is present in human metabolome and comprises differences in levels of sphingomyelines, phosphatidylcholines, acylcarnitines and amino acid glycine. Our study provides new important insights into sex-specific differences of cell regulatory processes and underscores that studies should consider sex-specific effects in design and interpretation.

Biography

Jerzy Adamski is Head of Genome Analysis Center at Helmholtz Zentrum München, which integrates platforms of genomic, transcriptomic, proteomic and metabolomic research, promoting high throughput research in mechanisms of the development and progression of complex diseases. He has a large scientific record in metabolism, molecular biology and biomarkers of frequent human diseases. He published over 200 papers in peer-reviewed journals and acts as Editor-in-Chief for Journal of Steroid Biochemistry and Molecular Biology.