METABOLOMIC ANALYSIS REVEAL POTENTIAL METABOLITES AND BIOLOGICAL PATHWAYS INVOLVED IN AGING AND OBESITY IN KAZAKH POPULATION

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Keywords: metabolomics analysis, metabolites, Kazakh population

Introduction: The determination of metabotype variations can be used to predict disease risk and diagnosis, understand molecular pathophysiology, interpret the understanding of environmental and lifestyle influences, develop and evaluate drug efficacy, toxicity, and adverse reactions. In this study metabolic differences among adults living in Kazakhstan are assessed to identify and characterize the metabolic profiles.

Methods: To perform the tasks, metabolom study of plasma was conducted among 74 Kazakh nationality study participants. The study was carried out on a platform based on tandem technology of ultra-high liquid chromatography and mass spectroscopy (Ultrahigh Performance Liquid Chromatography-Tandem Mass Spectroscopy). The necessary logarithmic transformation and ANOVA variance analysis, a two-sample Welch t-test, were performed to determine the bio-compounds that differed significantly between the experimental groups.

Results: The study was conducted in order to identify metabolic differences in human plasma collected from obese and non-obese subjects from Kazakhstan. Subjects were further stratified by age (young <45y, old >45y) as well as gender. As a result of 74 participants, 853 different biochemical indicators of the main pathways for the metabolism of amino acids, pethids, nucleotides, carbohydrates, cofactors and vitamins, xenobiotics, lipid and energy metabolism were identified. These results demonstrate alterations in various putative metabolic pathways in older participants in research compared to younger subjects. Metabolic differences included changes in metabolites related to: fatty acid utilization (medium-chain, long-chain, polyunsaturated, and branched-chain free fatty acids); steroidogenesis (steroid hormone metabolites: pregnenolone sulfate,21-hydroxypregnenolone monosulfate and others); carnitine-conjugated lipids (laurylcarnitine, myristoylcarnitine, palmitoylcarnitine, and palmitoleoylcarnitine); secondary carnitine metabolism (acylcarnitines); inflammation and oxidative stress (monohydroxy-, dihydroxy- fatty acids and eicosanoids).

Conclusion: The changes in several known metabolites and various prospective metabolic pathways in the group older than 45 years are found compared to a group of young people. Metabolic differences included changes in metabolites associated with the metabolism of fatty acids, steroidogenesis (steroid hormone biosynthesis), secondary carnitine metabolism, inflammation and oxidative stress. Finally, for future studies, since there is a strong lipid signature in this dataset, it may be of interest to consider our complex lipid panel for quantitative assessment of complex lipid-related changes.