Correlation between Bisphenol A, Perfluorooctanoic Acid, and Polychlorinated Biphenyls and Uridine Diphosphate Glucuronyltransferase Polymorphisms in Metabolic Syndrome Patients

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Project Leader

Endocrine-disrupting chemicals (EDCs) are exogenous chemicals which are able to interfere with hormone action. They are emerging as significant environmental contaminants, particularly in food and water. Although there are many synthetic chemicals that may be considered as EDCs due to their endocrine-disrupting properties, there are a number of classes which are most commonly studied. These include phenolic compounds, phthalates, polyhalogenated compounds, polycyclic aromatic compounds, pesticides, and pharmaceuticals.

The presence of such EDCs in drinking water supplies raises concerns on the potential long-term impacts of unintended exposure on the general population. Many studies have reported the detrimental effects of EDCs on humans. Possible consequences to human health include dysregulation of metabolism and an increasing occurrence of metabolic disorders such as obesity, type 2 diabetes (T2D), and metabolic syndrome (MetS).

Although detection methods have been developed for individual classes of EDCs in human blood, there is a need for extraction and detection methods which can encompass multiclass EDCs with differing chemical properties. The collection of blood samples is an invasive form of biomonitoring; therefore, a method which can study an array of contaminants from a minimal amount of blood is ideal.

Differences in the susceptibility of people to the adverse effects of EDCs may result from differences in the amount of these EDCs consumed and variability in the ability of individuals to effectively excrete the EDCs. After ingestion of these EDCs through drink and water, they are taken up by the body and must be metabolized for efficient excretion. Polymorphisms of genes encoding the enzymes for the metabolism of these EDCs may explain interindividual variability in risk for diseases associated with their exposure.

The first objective of this research project is to develop and validate a method for the extraction and quantification of three EDCs – bisphenol A (BPA), perfluorooctanoic acid (PFOA), and perfluorooctane sulfonate (PFOS) – from human plasma. The validated method will then be used to achieve the second objective, which is to investigate the levels of these three EDCs in MetS and non-MetS patients to determine if there are correlations between the presence of these EDCs and MetS outcome. Finally, we will be investigating functional UGT1A1 and UGT2B15 genetic polymorphisms in MetS and non-MetS patients, and thus assessing the effects of UGT single nucleotide polymorphisms (SNPs) on BPA, PFOA, and PFOS metabolites in MetS patients.

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