Metabolomics in Nanotoxicity and Exposome Studies

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ABSTRACT

Metabolomics provides a high-throughput approach to quantify the metabolic fingerprint of biological systems under different physiological conditions. The combined analysis and interpretation of the acquired metabolic profiles in the context of the relevant metabolic networks can provide a comprehensive perspective of the metabolic state changes and response to various stimuli and factors. In this context, metabolomics has gained momentum as a tool in nanotoxicity and exposome studies complementing the current measurement toolboxes, contributing also to the elucidation of the biomolecular mechanisms shaping the particular responses and the identification of sensitive biomarkers for early diagnosis of any physiological consequences. Metabolomic data can be combined with other omics to a more detailed perspective of the molecular physiology of the affected systems.

In this presentation, we will show the contribution of metabolomics in nanotoxicity and exposome research in the context of two collaborative studies of our group. The first is taking place in the context of the H2020 project DIAGONAL #953152 ("Development and scaled Implementation of sAfe by design tools and Guidelines for multicOmponent aNd hArn nanomateriaLs"), where we investigate the effect of multicomponent and harn nanomaterials on human physiology and the environment by metabolically profiling particular model systems. These include earthworm and algae cultures for the study of ecological consequences, and cellular models of human tissues such as skin and lung, for the study of health effects. The second investigation is a recent collaboration with Dept. of Physical Education, Sports Science and Dietetics, University of Thessaly and Faculty of Medicine, National and Kapodistrian University of Athens, investigating the role of pesticides as endocrine disruptors in the physiology of pregnant women and their male offspring. In both studies, metabolomic data can contribute to the development of sustainable practices for the use of both nanomaterials and pesticides.

KEYWORDS: metabolomics, exposome, nanotoxicity, endocrine disruptors, multicomponent and hArn nanomaterials