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Mapping the Air Pollution Metabolome: Applications, Limitations, and the Path Forward

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High-resolution metabolomics (HRM), involving the quantitation and identification of thousands of exogenous and endogenous metabolic features, has emerged as a promising tool for biomarker discovery and etiological inquiry into environmentally-mediated disease. Previous HRM-based studies have focused on questions related to the analytical sensitivity of high-resolution platforms in generating high quality data, optimal biological matrices for use in research applications, and limited investigations examining associations between specific environmental stressors and corresponding metabolite expression. Recently, several groups have demonstrated the capability of HRM to reflect internal metabolic signals associated with urban air pollution in panel-based and cohort study settings. These results, while promising, raise questions related to concordance and coherence of findings among studies, the necessity of developing standard protocol in collecting and processing HRM data, and specific applications and limits of HRM as a means of informing air pollution epidemiology. This symposium, sponsored by the HERCULES Exposome Research Center, a cross-institution initiative designed to promote infrastructure and expertise in exposome research, will include presentations and discussion from groups actively engaged in HRM-based air pollution health effects research. The session will conclude with comments from a select panel to explore the potential of HRM for generating new hypotheses through pathway discovery and in the development of new, biologically-relevant exposure metrics for air pollution health studies.