

Track 4. Chemistry and Exposure Assessment

Identifying and Linking Environmental Exposure to Biological Effects

Chairs: Denise MacMillan, Stephan Baumann

Increasingly, many groups of chemicals are being found to be of concern because of their high levels of human usage as well as their linkages to adverse biological effects. These chemicals of emerging concern (CECs) include natural and synthetic hormones, pharmaceuticals and personal care products, endocrine disrupting compounds (EDCs), and PFASs (e.g., perfluorooctanesulfonate [PFOS]). Exposures to these chemicals occur through a multitude of routes; they are encountered in consumer products and diet, the biosphere, and indoor environments. Additionally, CECs can be transformed by biotic (i.e., microorganisms and wildlife) or abiotic (e.g., ultraviolet) processes, with resulting transformation products potentially having even greater health risks. As a result, the study and characterization of this chemical exposure space, or exposomics, is of great import from the standpoint of public health. Traditional targeted methods are proving to be insufficient to keep pace with the growing scope of exposomics, and the field has shifted towards discovery-based approaches such as suspect screening and non-targeted analysis (NTA) via high resolution mass spectrometry (HRMS). For these approaches, the advantage is the identification of a much larger and broader swath of chemical features versus traditional methods. Through analyses of a variety of monitoring samples, ranging from environmental (i.e., surface water, drinking water, food, house dust) to biological matrices (i.e., blood, tissue, urine), these approaches allow researchers to characterize the exposome from potential exposure source points to the internal biological environment.

Given the ability to generate a broader characterization of the exposome, the next challenge is to determine which of these exposure chemicals are significant from a health perspective. Study designs which incorporate biological analyses and/or health monitoring data alongside exposomics analyses allow for the potential to identify linkages between chemical and biological effects. For this session, we welcome research relating to the occurrence, monitoring, and fate of emerging contaminants (exposomics) in the environment. We will consider targeted and nontargeted approaches but will give favor to approaches that help integrate analytical with biologically based 'omics techniques (e.g., epigenomics, genomics, lipidomics, metabolomics, proteomics, transcriptomics). Integrations of exposomics studies with bioassays (including effect-based approaches) as well as geospatial, temporal, and individual health data studies are also within the scope of this session.