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Accepted Sessions

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SETAC North America 45th Annual Meeting

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1. Environmental Toxicology and Stress Response

Acquired Pollution Resistance: A Range of Mechanisms From Acclimation to Adaption, and Potential Fitness Costs

Cole Matson, Bryan Clark, Jinhee Choi

The solution to pollution is evolution...or epigenetics...or phenotypic plasticity...or ??? There are a variety of physiological and genetic mechanisms that can lead to acquired pollution resistance in organisms. Some are physiological and can include phenotypic plasticity, but these are not generally thought of as heritable, although an organism's ability to alter developmental trajectories would have a genetic basis. However, other mechanisms, like epigenetic modifications, are partially heritable. Finally, genetic adaptation via natural selection, resulting from either existing genotypes, or via de novo mutation is heritable. Acquired resistance has been documented for a variety of contaminant classes, and in numerous different taxonomic groups. The goal of this session is to examine different mechanisms through which organisms acquire pollution resistance, the potential implications and tradeoffs for resistant populations, and the potential impacts and considerations for risk assessment. Topics are not limited by stressor or organism. All aspects of resistance are of interest, including mechanisms, heritability, cross-resistance, fitness costs, and secondary compensatory adaptation.

Keywords:

Molecular Toxicology

OMICs

Aquatic

1. Environmental Toxicology and Stress Response

Advances in Bioaccumulation Science and Assessment

Macarena Rojo, Karla Johanning, Markus Brinkmann

Bioaccumulation is a key component in the assessment of a chemical's risk to the environment and human health, and is a requirement of many global regulations for chemical management. Chemicals that bioaccumulate are of concern because they have the potential to achieve high concentrations in biota, which can lead to toxicological effects. In support of bioaccumulation assessment, there has been significant progress in the development of new approach methodologies (NAMs) to support the search for suitable animal alternatives (e.g., OECD 319A and 319B, Hyalella azteca (HYBIT) assay). These advances have been fundamental in establishing regulations and legislation (e.g., REACH, CLP, LCSA), to improve chemical screening, prioritization, and assessment. Although there has been significant progress, inter-species comparisons, in vitro-in vivo extrapolation (IVIVE), difficult-to-test chemicals (e.g., superhydrophobic chemicals), and the lack of more accurate predictive tools continue to be major challenges for bioaccumulation assessments. This session focuses on recent advances in bioaccumulation science, specifically those related to i) furthering the understanding of bioavailability, bioconcentration, bioaccumulation, biotransformation, and biomagnification of organic chemicals, ii) integrating bioaccumulation data into comprehensive hazard and risk assessments, and iii) developing and applying predictive tools to advance bioaccumulation studies. The session welcomes presentations on non-ionic organic chemicals (e.g., legacy or emerging contaminants), micro/nanoplastics, ionizable organics (e.g., pharmaceuticals, PFAS), complex natural substances, and mixtures/UVCBs. Presentations may include the analyses of laboratory and field data, and the use of in vitro, in vivo, and in silico methods. Research may include but is not limited to: 1) the use of passive sampler data in improving the understanding of bioaccumulation processes (e.g., contaminant adsorption/sorption on microplastics, passive sampling/dosing); 2) assessments of toxicokinetic and toxicodynamic processes; 3) IVIVE methods; 4) development of NAMs, including QSARs and in vitro test methods (e.g., assays using cell lines, whole cells, and sub-cellular fractions); 5) bioaccumulation in air-breathing species and terrestrial organisms; 6) food web bioaccumulation models; and 7) the regulatory application of bioaccumulation data in hazard (i.e. PBT), exposure, and/or risk assessments.

Keywords:

Bioaccumulation

Ecological Risk Assessment

Environmental Exposure

1. Environmental Toxicology and Stress Response

Advances in Environmental Quality Guidelines, Criteria, Objectives and Benchmarks

Janet Cermak, Mike Elias

Environmental quality guidelines, including criteria, objectives, or other effects benchmarks, form a cornerstone of risk assessment, environmental management and reporting on the state of the environment. They are developed for myriad environmental media, including water, sediment, soil, groundwater, air, soil vapour, and tissues, for the protection of ecological receptors. Recent developments have focused on improving the relevance and applicability of guidelines through scientific advancements including the incorporation of multiple toxicity modifying factors, development of innovative approaches for data-limited contaminants, improving models that account for bioavailability, consideration of mixtures, integrating New Approach Methodologies and strengthening the statistical basis for species sensitivity distribution. The aim of this session is to investigate scientific advances informing the development of environmental quality guidelines and bring awareness on progress in the development of individual guidelines and guideline protocols. This session is most relevant to those interested in and/or responsible for developing and applying the science supporting environmental quality guidelines including regulators, risk managers, consultants, industry representatives and academics.

Keywords:

Regulatory Science

General

1. Environmental Toxicology and Stress Response

Behavioral Endpoints and Methods as a Line of Evidence in Regulatory Toxicity Testing

Michael Bertram, Lauren Zink, William Goodfellow, James Lazorchak

Interest in the use of behavioral endpoints in toxicity testing has been growing across sectors as a way to investigate the sublethal effects of contaminants in the environment. Organisms have developed specific mechanisms for tasks such as identifying prey, avoiding predators, sexual displays, and territorial behaviors, all of which are fundamentally important to individual and population-level fitness. Chemicals in the environment impact organisms by altering, disrupting or masking these necessary behaviors. Further, technological advances such as machine learning and automated detection frameworks have increased the accessibility of behavioral toxicity testing. Despite this, regulatory toxicity studies primarily use apical endpoints such as mortality, growth, and reproduction, and most regulatory guidelines do not address behavioral changes. While these apical endpoints provide definitive evidence in toxicity testing, advances in behavioral toxicity testing facilitate connections across levels of biological organization and offer evidence on the mode-of-action of contaminants. Furthermore, the One Health ERA that assesses contaminant hazards in both human and environmental health, encourages the use behavioral responses. The expansive potential of behavioral toxicity tests necessitates a guided framework for standardizing these tests. A new tool has been proposed, the EthoCRED evaluation method, for assessing the relevance and reliability of behavioral ecotoxicity data, which considers the unique requirements and challenges encountered in this field. This method and the accompanying reporting recommendations, are designed to serve as an extension of the 'Criteria for Reporting and Evaluating Ecotoxicity Data (CRED)' project. As such, EthoCRED can both accommodate the wide array of experimental approaches seen in behavioral ecotoxicology and is able to be readily implemented into regulatory frameworks, allowing for better integration of knowledge gained from behavioral testing into environmental protection. This session will provide a platform for experts from different disciplines and career stages to provide their insights into the behavioral responses of animals to contaminants across multiple trophic levels. The ultimate objective of the session is to synthesize the current state of knowledge on behavioral effects of contaminants and other stressors to inform environmental assessment, monitoring and management in natural systems.

Keywords:

Risk Assessment

Modeling

Decision Analysis

1. Environmental Toxicology and Stress Response

Bioconcentration and Biological Magnification of Emerging Contaminants: Synergism and Antagonism

Chioma Nwakanma, Egbo Walamam Mansi, Nwachukwu Olayinka Ibiyinka, Ogbulie Toochukwu E.

Chemical substances exert a wide range of effects depending on the amount received. Average citizens are exposed to toxic substances at home, at work, or while moving about outdoors. In many cases they have little control over exposure. Predicting the harmful effects of chemicals is no easy task. The presence of two or more toxic substances can alter the expected response or negate each other's effects. When harmful chemicals become concentrated in organisms, trouble may begin. Bioconcentration is the accumulation of certain chemicals within the body. This opens door for biological magnification. The question remains: Are we losing the war against these emerging contaminants? What are the market incentives to controlling toxic chemicals? How do we build the future with the view of these emerging contaminants? Are their more novel methods to incorporate in research? The session welcomes the applications of methods and modification, biotic index, risk assessments, novel solutions to addressing the emerging issues. It is expected that the research works presented will enumerate a comprehensive understanding of bioconcentration and biomagnification in toxicological studies for future directions. The session welcomes submission of abstract from researchers, experts, scientists, policy makers, students in academia, government and stakeholders, industry and private sector practitioners to ensure decision making system that seeks to optimize the future by acting now towards a sustainable society.

Keywords:

Bioaccumulation

Combined Exposure / Mixtures / Multiple Stressors

Human Health

1. Environmental Toxicology and Stress Response

Case Studies Using Molecular Tools and New Approach Methodologies for Assessing Toxicity in Non-Model Species

Candice Lavelle, Joseph Bisesi, W. Henderson, Chris Vulpe

The vast number of chemicals released into the environment precludes comprehensive toxicity testing to provide all data necessary to assess ecological risk. Therefore, in practice, several model species serve as surrogates for many non-model taxa. However, little toxicity data exists for most of these species, resulting in considerable uncertainty in extrapolating across taxonomic domains. Additionally, sublethal apical effects of regulatory interest (growth, reproduction) may not be observed at the organismal level during standard toxicity tests with model species. Finally, recent national and international efforts have called for reductions in animals testing with a focus on developing new approach methodologies (NAMs) that will allow for more robust testing of legacy and emerging contaminants to more accurately assess toxicity across diverse vertebrate and invertebrate taxa.

Molecular tools, which include but are not limited to, -omics (metabolomics, proteomics, and transcriptomics, metagenomics), as well as in vitro (cell based assays, binding assays, etc) and in silico (modeling, QSARS, artificial intelligence, machine learning) based approaches have all emerged as valuable NAMs for examining sensitivity to toxicants across non-model species. Using these tools can help increase testing capacity and efficiency to meet the demands of chemical risk assessment needs while also decreasing animal testing. Additionally, these approaches may be useful in "real-world" studies in ecological areas of interest.

The proposed session invites presentations of case studies that have developed and/or utilized molecular tools and/or new approach methodologies to generate data that can be useful for extrapolating exposure to and effects of chemicals on non-model species. "Off the shelf" resources and tools for a limited number of model species are increasingly available, however, they are not always directly transferable to non-model species, therefore this session will emphasize studies that have modified or developed approaches for non-model species. These studies will demonstrate the utility, challenges, and successes of incorporating molecular tools and new approach methodologies in non-model species.

Keywords:

OMICs

High Throughput

Molecular Toxicology

1. Environmental Toxicology and Stress Response

Cell-Based Approaches for Ecotoxicity Assessments

Matteo Minghetti, Nadia Carmosini, Gavin Saari, Justin Scott

Cell-based in vitro methods are becoming increasingly important in the field of environmental toxicology as academia, environmental agencies and private corporations seek to develop alternatives to the use of animals in toxicity testing and investigations into chemical mechanisms of action. Indeed, the number of publications describing cytotoxicity assays with commercial or novel cell lines is growing annually. In light of this rapid progress, careful consideration must be given to the development of new cell-based approaches and expanding the repertoire of tissue types and organisms of origin for cell lines. Furthermore, to promote and improve the physiological relevance of in vitro models, cell line characterization with respect to tissue-specific features, including transcriptome, proteome, and enzyme activity, is imperative. Finally, the use of an appropriate cell substrate that enables a physiologically relevant microenvironment also warrants evaluation. To facilitate progress in these areas, this session will bring together scientists with an interest in toxicology and alternatives to animal testing to discuss the following topics: (i) development and characterization of novel cell types (both primary and immortalized) from mammals and non-mammal models; (ii) development and characterization of new cell-based methodologies for use in toxicology (e.g., co-culture techniques, 3D culture protocols); (iii) optimization of cell-based conditions for environmental toxicity studies (e.g., use of novel and environmentally relevant exposure medium); (iv) cell-based assay sensitivity compared to in vivo approaches (i.e., establishing correlations between in vivo and in vitro toxicity). This informative session will present the state-of-the-art cellular-based approaches and offer insights into the domain of applicability of in vitro assays.

Keywords:

Animal Alternatives

Predictive Toxicology

Risk Assessment

1. Environmental Toxicology and Stress Response

Comprehensive Exploration of Immunotoxicity, Disease Susceptibility, and Immunology Across Organisms

Cheyenne Smith, Drake Phelps, Maria Rodgers, Nora Hussain

As alterations in immune function are often at the root of emerging disease, the impact of various stressors on immunity is expected to play a significant role in connecting environmental stress with diseases in aquatic organisms and wildlife. To maintain optimal health at both the individual and population levels, organisms must be able to defend themselves from infection and disease. Immunotoxicology focuses on alterations of the immune system (immunomodulation) caused by environmental stressors, including anthropogenic contaminants. Exposure to chemicals and other environmental stressors can hinder this ability by directly or indirectly modulating immunity, leading to disease, death, and population declines. We seek to unite researchers across disciplines to delve into the intricate interplay between environmental stressors, immune responses, and disease susceptibility in various organisms. With a focus on both in vivo and in vitro studies conducted in field and laboratory settings, this session aims to elucidate the complexity of immune responses, particularly in aquatic and terrestrial wildlife species. This session will emphasize the immunomodulatory effects of environmental stressors at all levels of biological organization, from molecular processes to whole-organism responses. We hope to advance our understanding of mechanisms behind organismal immune function and overall susceptibility to disease when facing environmental stress and fill in knowledge gaps related (but not limited) to combinations of stressors, basic host-pathogen interactions for many environmentally relevant species, and how to select appropriate exposure and effect parameters for better comparison across studies. Additionally, we would like to invite and encourage participants to present research addressing new dimensions in the field of immunotoxicity such as behavioral phenotypes, diet, microbiome, and epigenetics as we recognize the intricate interplay of additional factors that may impact immune outcomes. Ultimately, the session aims to foster collaboration among scientists studying diverse aspects of immune functions and diseases.

Keywords:

Adverse Outcome Pathways

Toxins

1. Environmental Toxicology and Stress Response

Distinguishing Mode-of-Action-Specific Toxicity From Non-Specific Effects: An Endocrine Disruption Conundrum

Ellen Mihaich, Scott Lynn, Jeffrey Wolf

Increasingly, there is scientific interest, if not also regulatory need, to incorporate information on the mode of action (MoA) through which a substance triggers environmental and health effects. If the MoA can be determined, it can potentially inform a myriad of important considerations for hazard and risk assessment, such as the scope of the potential adverse effects, the conditions under which they may occur, and the dose-response characteristics of those effects including their potential dependence on potency, toxicokinetics and route of exposure. Amidst this excitement to elucidate MoAs, however, inadequate attention has been given to the problem of distinguishing between toxicity that occurs as a result of a specific MoA versus toxicity that occurs as a consequence of non-specific processes. This dilemma is especially pronounced when dealing with endocrine-active substances (EASs), which may operate through various MoA, potentially influencing multiple hormone pathways and causing effects across diverse tissues. Furthermore, endocrine responses can exhibit adaptive characteristics aimed at preserving homeostasis rather than instigating irreversible adverse effects. The probability of indirect effects rises in (eco)toxicological investigations that require the use of maximum tolerated concentrations or doses, which are expected to elicit some form of adverse reaction. The misidentification of systemic or indirect effects as truly endocrine mediated has serious consequences for prompting animal- and resource-intensive testing and adverse regulatory actions. In consideration of the points above, the focus of this session is to explore challenges encountered in making MoA distinctions. Presentations and case studies that explore the use of new testing and assessment strategies, identify new endpoints that add clarity to endocrine system evaluations, incorporate the use of in silico models and in vitro assays, as well as other new approach methods (NAMs) designed to differentiate between endocrine activity, endocrine disruption, and non-endocrine modes of action are sought. Insights into how mechanistic responses and adverse outcomes should be interpreted in terms of endocrine versus non-endocrine effects, including consideration of their population relevance, are encouraged.

Keywords:

Adverse Outcome Pathways

Endocrine Disruption

1. Environmental Toxicology and Stress Response

Emergent Environmental Issues and Perspectives in Latin America

Adriana Bejarano, Martha Orozco Medina, Patricia Ramirez Romero, Marcela Galar Martinez

Latin America's economic development is bringing increased attention to environmental issues at local and global scales. Although economic growth and progress are intended to create a source of income for local economies, there are unintended consequences that often result in increased pressure on biological and ecological resources. Multiple factors are driving environmental impacts in Latin America, including regulated and unregulated extraction of resources, increased demand for goods and services, industrialization, and the expansion of the agricultural frontier, among others. Regulatory frameworks with limited environmental enforcement and regulatory oversight intensify threats from these and other environmental pressures. In this session, we will explore multi- and transdisciplinary research addressing pressing environmental issues in Latin American countries, including transboundary and common issues. Leading environmental issues in the region include, but are not limited to reduced water quality, eutrophication, unregulated and underregulated use of agrochemicals, non-point source pollution, deforestation, land use changes, unplanned urbanization and tourism, exploitation and extraction of non-renewable sources, and climate change. Presenters are encouraged to submit presentations on all aspects of environmental issues in Latin America and their links to environmental toxicology and chemistry. Topics of interest may include aquatic and wildlife eco-toxicology, threats to biodiversity, ecological risk assessment, and fate and effect assessments, among others. This session will provide an opportunity to assess the state of knowledge in the field of environmental toxicology and chemistry in Latin America, and it may help to identify priority areas for research and multistakeholder collaboration.

Keywords:

Science Communication

Tropical

Risk Assessment

1. Environmental Toxicology and Stress Response

Environmental Issues in the Gulf of Mexico

Adriana Bejarano, Kevin Armbrust, Ed Wirth

The Gulf of Mexico is a large, complex and productive ecosystem that supports a high biological and ecological diversity biodiversity, while also supporting a strong economy through commercial fisheries, shipping and trading, tourism, and access to energy resources. However, this marine ecosystem faces multiple environmental challenges from different drivers, including but not limited to non-point source pollution, stormwater and agricultural runoff, accidental spills of hazardous substances, harmful algal blooms, climate change, etc. The session on the Gulf of Mexico is intended to highlight current environmental challenges and solutions specific to this important ecosystem. Presenters are encouraged to submit presentations on environmental issues specific to the Gulf of Mexico, and their links to environmental toxicology and chemistry. Topics of interest may include water quality, aquatic and wildlife eco-toxicology, threats to biodiversity, ecological risk assessment, environmental monitoring, multiple-stressors, among others. This session will also provide an opportunity to assess the state of the knowledge, and it may help to identify priority areas for research and multistakeholder collaboration including fostering a transition to a Blue Economy.

Keywords:

Climate Change

Environmental Monitoring

Ecosystem Service

1. Environmental Toxicology and Stress Response

Exposure and Effects of Micro- and Nanoplastics in the Environment

Tham Hoang, Sarah Au, Stacey Harper

Many studies have demonstrated potential toxicity of plastic particles at multiple biological levels of organization in both terrestrial and aquatic ecosystems. Additionally, increased use of plastics and subsequent associated plastic waste can potentially lead to a more exposure to plastic particles in natural environments. Although research on different exposure and effect scenarios of plastics has grown in recent years, the toxicological effects of micro- and nanoplastics are still not fully understood, especially for micro- and nanoplastics associated with other chemicals. This paucity of data and information currently limits our ability to conduct environmental risk assessment for micro- and nanoplastics. This session invites presentations that address research on exposure and effects of micro- and nanoplastics which may be used to support environmental risk assessments and management of micro- and nanoplastic particles. Specifically, research that focuses on environmentally-found micro- and nanoplastic particles, those associated with organic and inorganic pollutants, and the mechanism of toxicity of these plastic particles in support of environmental risk assessment is strongly encouraged to present in this session. The views expressed in this session proposal are solely those of the authors and do not represent the policies of the U.S. EPA. Mention of trade names or commercial products should not be interpreted as an endorsement by the EPA.

Keywords:

Plastics (Micro- or Nano-)

Environmental Exposure

1. Environmental Toxicology and Stress Response

General: Environmental Toxicology and Stress Response

This session aims to explore environmental toxicology and response to stress (biological, physical and chemical) in various system. It encompasses in silico and in vitro tools and methods involving adverse outcome pathway (AOP), mode of action, molecular toxicology, -omics, animal alternative testing, quantitative structural activity relationship (QSARs), high-throughput techniques and emerging approaches for statistical toxicology.

This session will be poster only.

Keywords:

General

1. Environmental Toxicology and Stress Response

Integrating Multiple Endpoints To Support Omics-Based Research for Ecotoxicology

Mary Jean See, Meagan Bell, Prarthana Shankar

'Omics-based tools (transcriptomics, metabolomics, genomics, proteomics, etc.) are popular methods for understanding molecular effects of environmental toxicants in animal models. However, most studies are limited to 'omics datasets, traditional toxicology apical effects (reproduction, growth, and mortality), or a combination of these endpoints. Emerging studies are connecting 'omics and traditional endpoints with organ- and tissue-level lines of evidence for toxicity, such as histology and immunotoxicology, as well as sensitive, sublethal, and high-throughput whole-animal endpoints, such as behavior and fitness. Integrating datasets from various molecular, cellular, tissue, organ level studies, or whole-animal endpoints, will produce robust evidence to support environmental decision-making as well as prioritization of chemical hazard. Importantly, the multi-endpoint studies will provide data necessary for a mechanistic basis of read-across that will help build reliable predictive toxicology models, to help transition away from traditional, resource heavy whole-animal studies.

This session aims to present emerging 21st century ecotoxicological studies integrating 'omics with organ- and tissue-level assays to whole-animal endpoints, high-throughput screening, and in vitro approaches. Presentations will highlight research that includes, but not limited to 1) incorporating 'omics-based tools using high-throughput whole animal or in vitro tissue culture studies, 2) connecting 'omics datasets to traditional toxicology endpoints, and/or 3) providing multiple lines of evidence demonstrating chemical toxicity.

Keywords:

OMICs

Molecular Toxicology

1. Environmental Toxicology and Stress Response

Linking Molecular Impacts to Organism Health: Empirical and Theoretical Methods To Scale Contaminant Effects

Louise Stevenson, Jason Magnuson, Cheryl Murphy

Molecular endpoints and high-throughput assays produce a wealth of information, but it can be difficult to translate this into measurements of the ecological risk of contaminants. A chemical's effect is traditionally measured at the individual level, through empirical measurements of a potential stressor on lethal responses; although, a recent shift has led to a greater focus on sublethal effects. This shift coincides with an increased availability of molecular tools and high-throughput behavioral analyses to characterize sublethal toxic responses. However, there are gaps that exist in relating molecular-level effects to higher biological levels of organization, which limits interpretation. The predictive power of datasets measuring suborganismal endpoints in response to chemicals can be increased by connecting the impact of a stressor on a biochemical pathway or mode of action that is not specific to a single organism, environment, or even chemical. However, this rests on our ability to translate effects observed at the molecular level quantitatively to impacts on individuals. This session is focused on anchoring molecular-level endpoints to higher biological functions such as histological, physiological, and behavioral apical endpoints using empirical and/or theoretical methods.

This session aims to present the latest science in aquatic and ecotoxicology, spanning multiple levels of biological organization through experiments and/or modeling. Presentations may include experiments in which data were collected at multiple levels of biological organization, theoretical models developed to explain patterns observed at one level and predict those at another, or related work. Models and empirical data presented can be of existing theory or datasets reanalyzed for a novel application to connect effects across levels. The goal of this session is to highlight the work being done to bridge these gaps and to potentially foster new collaborations between empirical and theoretical scientists by hosting a session that specifically encourages contributions from both realms.

Keywords:

Adverse Outcome Pathways

OMICs

Ecological Risk Assessment

1. Environmental Toxicology and Stress Response

Microbial Metagenomics: An Emerging Tool for Predictive Ecotoxicology

Joseph Bisesi, Kelsey Thompson, Christopher Martyniuk, Jessica Donaldson

A microbiome is any aggregate community of microorganisms that work together to perform a specific function. These communities can be found in environmental matrices, such as soil and water, or as symbiotic residents in or on host organisms. The microbiome has emerged as an important mediator of environmental quality as well as disease outcomes in host organisms, which that has been shown to be modulated by chemical exposures. Disruption of symbiotic relationships between the environment, animals, and microflora leads to adverse effects associated with chemical metabolism, endocrinology, and behavior. Additionally, studies now indicate that profiling microbial species in host tissues and/or environmental matrices can be accurate predictors of chemical exposure. Critical research is needed to better explore the relationship between the environment, exogenous stressors, host organisms, and the microbiome, as well as how contaminant-induced shifts in the microbiome may affect host responses to external factors. This session invites studies that utilize microbial metagenomic and metatranscriptomic tools as well as other methods to investigate microbiome responses to environmental contaminants, including those that report on microbial richness and diversity in relation to phenotypic endpoints that are related to organism health. We also encourage presentations that use the microbiome in such as way to predict or quantify the higher level impacts of chemical exposures. These studies will increase understanding of how environmental contaminants regulate host-microbiome interactions, an emerging area that requires further investigation.

Keywords:

Molecular Toxicology

Predictive Toxicology

OMICs

1. Environmental Toxicology and Stress Response

Multi-Omics Applications in Systems Toxicology

Candice Lavelle, W. Henderson, Yvonne Rericha, Weichun Huang

Toxicological responses to environmental toxicants or stressors involve a multitude of complex biological processes, each involving multiple levels (e.g., organism, tissue, cell, and molecule) with multiple layers (e.g., DNA, RNA, and protein at molecular level). Systematic assessment of toxicological effects is enhanced through detection of changes in morphology, behavior, physiology, biochemical pathways, a variety of biomolecules, etc. Omics techniques such as genomics, transcriptomics, proteomics, and metabolomics offer a high-resolution view of biological response at the molecular level, and hence are increasingly leveraged in toxicological assessment of environmental toxicants and stressors. While each single-omics technique is powerful for biomarker identification, each technique has its own specific technological limitations that could either result in insufficient power to detect true changes or lead to many false discoveries. More critically, a single omics alone, detecting only one-type of biomolecules and thus capturing only changes at a single biological layer, does not provide a holistic, systematic understanding of toxicological responses or adverse outcome pathways. A multi-omics or a pan-omics approach combining two or more omics technologies (e.g., RNA-seq, Methyl-seq, and ChIP-seq) often with different modalities to gain insights not achievable by single-omics, could be the best solution to these problems in both ecological and human health assessments. Aiming to advance the ecotoxicology field, this session will showcase studies that leverage the power of multi-omics integration approaches to systemically evaluate the effects and mechanisms of known contaminants of emerging concern (e.g., PFAS, micro-/nano-plastics, phthalates). The topics covered in this session include multi-omics' applications, data integration methods and tools, and omics-integration resources, as well as the latest omics applications/methods in systems toxicology such as single-cell and spatial transcriptome. The benefits of multi-omics approaches, as well the common challenges for multi-omics applications such as experimental design, data pre-processing (normalization, low count removal, data imputation, etc.), transformation and mapping of heterogeneous data, dimension reduction, batch effects, method selection, and visualization etc. will be discussed in depth.

Keywords:

OMICs

Adverse Outcome Pathways

Big Data

1. Environmental Toxicology and Stress Response

Nano in the Environment: Garnering a Comprehensive Knowledge on Potential Hazards of Nanotechnology

Olga Tsyusko, Katrina Varner, Stacey Harper

Nanotechnological applications have increased significantly to address current global problems in agriculture, energy, environmental remediation, and human health. This has resulted in exponential increase in the nano-enabled products currently available and under development with higher direct and indirect release of the nanomaterials into the environment. This further highlights the importance in understanding the potential environmental and human impacts, and safety risks of nanotechnology to ensure sustainable development of nano-enabled applications. Accumulated knowledge needs to be assembled comprehensively to better understand nanomaterial behavior in the environment, predict their risk and to govern informed decisions and regulations. We anticipate this session to include studies that address mechanisms and consequences of nanomaterial abiotic and biotic interactions and welcome investigations that focus on a wide range of nanomaterials exploring their bioavailability, toxicity, and transformations in simple and complex exposure scenarios as we all as through food webs. We enthusiastically seek contributions of studies that consider aspects of realistic exposure concentrations and rates along with the discussion of predicting and evaluating environmental and human health risk. Abstracts that focus on the identification of system parameters that alter the surface characteristics of nanomaterials through aggregation, complexation, or changes in oxidation state are encouraged. Presentations and findings are welcomed on uptake, measurement, monitoring, fate, toxicity and toxicity mechanisms, effects, health, and safety, which include predominate use of nanomaterials in various fields, to ensure our sustained global future.

Keywords:

Nanotechology

One Health

Environmental Exposure

1. Environmental Toxicology and Stress Response

Navigating Environmental Risks in the Energy Transition and the Shift to a Circular Economy

Jonathan Naile, Adriana Bejarano

The global shift towards low carbon energy sources and a circular economy is essential for mitigating climate change and ensuring a sustainable future. However, this transition is not without its challenges. As we move away from fossil fuels and embrace renewables and bio-based and circular- feedstocks for low carbon chemical products and fuels, we must critically examine the new potential environmental risks that may arise. We invite presentations on research looking at environmental risks contaminants arising from these systems such as wind, solar, hydrogen, batteries, carbon-capture. We also invite presentations on research exploring the potential risks of incorporating circular feedstocks (e.g. bio-based or plastic-based) back into products and chemicals regulations around the registration of these products. Critically thinking of these technologies early in the development of low carbon systems will ensure that by reducing carbon society are not introducing new risks to the environment and expedite their safe adoption. This session aims to explore these potential risks, identify strategies for mitigation, and foster tri-partite dialogue for a holistic understanding of the energy transition's impact on our planet and pave the way for informed decision-making towards a more sustainable future.

Keywords:

Sustainability

Ecological Risk Assessment

1. Environmental Toxicology and Stress Response

Not Just Another Nam: Integrated, Intelligent, and Iterative Approaches to Ecological Risk Assessment

Julie Krzykwa, Kristin Connors, Wesley Hunter

There is increasing momentum and ambition towards incorporating NAMs (i.e., New Approach Methodologies or Non-Animal Methods) into ecological risk assessment of chemicals. In the past, conversations regarding implementation of NAMs have focused on a 1:1 replacement of existing toxicity test methods (e.g., OECD 236 replacing OECD 203); however, recently there has been interest in using NAMs to improve tools and assessments and to help reduce uncertainty (e.g., cross-species extrapolation, application factors, levels of concern, etc.) for a more holistic approach to risk assessment. It has become clear that no single alternative will be universally relevant for all chemistries and contexts of use. Instead, multiple NAMs could be combined in a modular manner alongside traditional in vivo testing when needed to address specific testing needs and to prioritize traditional in vivo testing such that it is only conducted when truly needed to fill data gaps. This integrated, intelligent, iterative strategy will help improve ecological risk assessment while also striving towards reduction, refinement, and replacement of animal use. The overwhelming consensus coming out from the multitude of NAMs workshops, meetings, and symposiums held in 2023 was the need for more illustrative case studies demonstrating the application of NAMs in environmental chemical hazard and risk assessments, with a focus on the applicability of various methods/tools for regulatory decision-making across jurisdictions. We invite presentations relating to the practical, integrated application of NAMs within different sectors and contexts of use covering diverse endpoints such as bioaccumulation, effluent assessment, endocrine disruption, and acute and chronic toxicity across taxa (aquatic and terrestrial). This session is sponsored by the Global Animal Alternatives Interest Group and hopes to highlight a diversity of NAMs and strategies to bring alternative test methods together to address regulatory-relevant endpoints and help protect biodiversity from chemical pollution.

Keywords:

Animal Alternatives

Risk Assessment

1. Environmental Toxicology and Stress Response

Omics Approaches for Assessing Chemical Hazard and Toxicological Response

Denise MacMillan, Logan Everett, W. Henderson, Tom Purucker

Omics approaches, including transcriptomics, genomics, proteomics, metabolomics, and lipidomics, provide systems level information on biomolecular concentrations and biological pathways impacted by chemical exposure and disease. The significance of omics in environmental toxicology and epidemiology is well-documented, with numerous studies employing these technologies to explore the effects of various contaminants on human populations and ecosystems. These approaches facilitate the identification of changes in biochemical levels and enhance our understanding of mechanisms leading to adverse outcomes prior to the onset of overt toxicity. They are instrumental in identifying reaction networks and potential biomarkers of xenobiotic exposure. Notably, dose-response changes observed with transcriptomics, and more recently metabolomics, from short-term studies can yield benchmark doses (or concentrations) that are concordant with or more sensitive than those derived from traditional apical endpoints in longer duration studies. Omics strategies are promising for accelerating assessments and reducing the costs associated with regulatory decision making, which has traditionally depended on multi-year repeat dose studies. When combined with measurements of internal dose and chemical biotransformation after exposure, omics approaches that identify perturbations to conserved pathways can also support cross species extrapolations.

This session aims to showcase the latest advancements in omics analyses, including multi-omic studies for assessing chemical hazard and toxicological response, and with applications in ecotoxicology and stress ecology that emphasize the potential of these methods for addressing biological processes as integrated systems. This includes establishing points of departure, characterizing molecular initiating and key events in adverse outcome pathways, and elucidating modes of action of chemical toxicity for in vivo and in vitro systems. Presentations summarizing omics workflows and results from in vivo and in vitro exposure studies are within the scope of this session, with a particular interest in those combining omics techniques and focusing on short-term exposures.

Keywords:

OMICs

1. Environmental Toxicology and Stress Response

Omics Beyond Transcriptomics: Leveraging Proteomics and Metabolomics To Improve Mechanistic Understanding of Responses to Environmental Stressors

Denina Simmons, Laura Langan

Deciphering the molecular mechanisms that underlie responses to chemicals and other stressors can inform the development of adverse outcome pathways (AOPs) that help establish the linkages between molecular-, cellular- and organism-level changes. This in turn can facilitate the integration of mechanistic knowledge and molecular data in environmental risk assessment strategies, and enable its use for guiding the development of alternative - that is, non-animal - toxicity assays or biomonitoring approaches, based on the molecular markers discovered. Among the different biomolecules present in the cells, proteins and metabolites have the closest links to phenotype, as they are directly involved in maintaining cellular structures and performing many cellular functions. This is reflected in the frequent identification of proteins and metabolites as components of molecular initiating events in the AOPs established so far, or their use as biomarkers of disease. Despite their importance, however, both proteins and metabolites have so far received relatively little attention in ecotoxicological research, with the bulk of molecular mechanistic studies being performed on the mRNA level (transcriptomics) so far. This bias was due to a suite of technical challenges that complicated the study of proteome and metabolome, compared to the faster-developed transcriptomics technology. Luckily, however, many of these challenges are now being overcome, allowing ecotoxicologists to venture beyond transcriptomics in their large-scale mechanistic investigations of biomolecular responses to environmental contaminants and stressors. To reflect on these developments, this session seeks to highlight studies that characterize the post-translation biomolecular phenome (i.e., proteomics and metabolomics, including lipidomics) using high-throughput and/or high-resolution techniques such as protein microarrays, mass spectrometry, nuclear magnetic resonance, and RAMAN spectroscopy, among others. We invite submission of studies performed in both in-vitro systems and animal models; investigations that attempt to make connections between molecular changes and higher-level phenotypic responses (cellular and above), mapped along the AOP continuum, are particularly encouraged. We also welcome multi-omic studies following a systems biology approach or focusing on the assessment of the complementarity and unique benefits provided by different omics data streams.

Keywords:

OMICs

Adverse Outcome Pathways

1. Environmental Toxicology and Stress Response

Pesticide Risk Assessment and Surrogacy for Pollinators and Non-Target Arthropods

Frank Green, Eric Peterson

Arthropods are one of the most diverse groups of organisms in the world. Unfortunately, many arthropod taxa such as coleoptera, hymenoptera, and lepidoptera are in decline and several species are considered threatened or endangered requiring additional protection under the Endangered Species Act (ESA). Disparity in sensitivity among arthropod life stages, multiple exposure scenarios and durations and differential species sensitivity, are all highly relevant for assessing potential risk to pollinators and other non-target arthropods, but poorly understood. Recent biological evaluations conducted by United States Environmental Protection Agency (US EPA) have demonstrated refinements to non-target arthropod risk using effects endpoints from non-standard test species, highlighting the progression of risk assessments in this underdeveloped area. Standardization of these "newer" test species is not well established, underscoring the challenges of testing or establishing standardized testing methods for some non-target arthropods and the need for identifying species that can be tested in the lab and help refine risk assessments. Furthermore, cutting edge research bridging molecular data across species, use of Sequence Alignment to Predict Across Species Susceptibility (SeqAPASS), and identifying novel invertebrate taxa for toxicity testing can all aid in refining potential risk to non-target arthropod species from exposure to pesticides as part of ESA assessments. Nonetheless, this area of ecological risk assessment is still in its infancy and requires thought provoking discussions and innovative ideas to further our understanding and more appropriately address and refine risk.

This session aims to present the latest science in pesticide risk assessments concerning pollinators and non-target arthropods, and how that relates to biological evaluations and biological opinions conducted in compliance with the ESA. Presentations on toxicity tests, measures of exposure, molecular bridging, and estimates of risk are highly relevant. Additionally, presentations regarding cross-species extrapolation, arthropod life cycle assessments, and pesticide-arthropod risk mitigation are welcomed and encouraged.

Keywords:

Pollinators

Ecological Risk Assessment

Pesticides /Plant Protection Products

2. Aquatic Toxicology, Ecology and Stress Response

Advances in Ecotoxicology of Scleractinian Corals and Other Coral Reef Organisms

Dorothy-Ellen Renegar, Carys Mitchelmore, Cheryl Hankins

Coral reefs are keystone coastal ecosystems, supporting significant biodiversity and economic structure worldwide. Coral reefs are also highly sensitive ecosystems that can be negatively impacted, either directly or indirectly, by a combination of global climate change (ocean warming and /or acidification) and regional stress from inputs of nutrients and an array of inorganic and organic chemicals including contaminants of emerging concern (CECs). Multiple exposure pathways exist as these contaminants may be dissolved, associated with suspended solids in the water column, present in sediment, or taken up by biota (potential food/prey items for coral). Assessment of the impacts of these stressors on coral reefs, whether alone or in combination, is a relatively emerging field where results are frequently equivocal, in part due to variable exposure and assessment methodologies in laboratory tests. Currently, there are no standard toxicity test methods described for any coral species which limits the ability to clearly characterize impacts or relative sensitivity across studies, chemical contaminants, species, and life stages.

The goal of this session is to bring together researchers and stakeholders who are investigating and/or interested in the exposure, fate, effects, and risk assessment of chemical contaminants in corals and other tropical marine species. The aim is to advance our knowledge on the occurrence of chemical contaminants on coral reefs, discuss impacts of current and emerging contaminants, and discuss toxicity mechanisms of action, particularly with respect to common and novel pathways. Presentations relating to the development of standard toxicity test methods for corals, including analytical verification methods for exposure are also highly encouraged.

Keywords:

Tropical

Environmental Exposure

Toxins

2. Aquatic Toxicology, Ecology and Stress Response

Advancing Aquatic Toxicity Test Methods: Developments in Testing and Data Analysis of Toxicity Test Methods for Effluents, Sediments, and Receiving Waters

Teresa Norberg-King, Stephen Clark, Jennifer Bouldin, Silvia Zavala

Standardized tests are used to measure toxicity for point source dischargers, sediments, ambient waters, and chemicals. Many of the test procedures used for determining whole effluent toxicity (WET) are used for water quality assessment, permit development and compliance, and the tests are used with new chemicals and to generate data for water quality criteria. In the US, both acute and chronic tests are required for effluents for major point source dischargers, ambient waters, sediments, environmental samples, and chemicals. However, these standard tests will vary due to the inherent method flexibility, regulatory requirements, and testing procedures across labs. Test results may vary depending on the water type used for both testing and culturing, choice of foods, and the testing procedures used across labs. Labs may individualize approaches to assess toxicity in challenging or uncommon scenarios due to physical constraints or conditions. This can lead to challenges in interpreting the results of the various test procedures due to matrix interference and limitations of species and test methods. This session explores approaches to address, and manage various environmental sample types (e.g., effluents, ambient/surface waters, stormwater, groundwaters, sediments) and discuss various improvements or adaptations to standardized methods and experimental designs or present new methods. In this session, presentations will focus on challenges encountered in culturing, testing, and evaluating WET data, non-WET data, chemical data, sediment data, or atypical types of samples or sample collection that may be subject to toxicity testing requirements. We encourage presentations that discuss new methods, proficiency evaluations, novel approaches, imitations of method applications and potential confounding factors inherent to matrices being tested, treatment technologies for toxicity remediation, toxicity identification, and new constituents considered for monitoring (i.e., contaminants of emerging concern) that include modifications to standardized methods. Additionally, we encourage presentations on topics such as test design features and control measures for new species, method modifications, solutions for confounding factors in sample matrices, study design and data collection structure, samples treated with novel or innovative best management practices or treatment designs, backend data analysis techniques and data interpretation for challenging and unique sample matrices.

Session supported by the Aquatic Toxicity Testing Interest Group

Keywords:

Aquatic

Environmental Monitoring

Predictive Toxicology

2. Aquatic Toxicology, Ecology and Stress Response

Aquatic Mixtures: Characterizing Chemical Composition and Estimating Hazard

Adam Biales, Tom Purucker, David Bencic

Aquatic ecosystems often contain highly complex mixtures that differ in their chemical make-up across temporal scales, geographic regions, and exposed receptors. While many studies have observed negative effects in receiving waters, few, if any, have definitively linked them to particular constituents of aquatic mixtures. Broadly speaking, whole effluent toxicity is an integrative measure of the actions of the mixture constituents, singly or in combination. Technological advancements have improved the characterization of mixtures both in terms of quantifying chemical composition and estimating exposure hazard. This enables a comprehensive accounting of the totality of chemical constituents present in the mixture and finer grained hazard assessments capable of identifying significant interactions among mixture constituents.

This process of decomposing chemical exposure and estimating hazard is often applied to wastewater effluent, but can also inform investigations regarding ambient waterways affected by nonpoint source pollution, landfill leachate, mining operations, oil spills, etc. These approaches aim to account for unknown or poorly characterized pollutants, especially concerning additive or interactive effects among coexisting molecules. This session will highlight research that: 1) introduces new approaches and technical advancements in the characterization of mixture constituents or mixture effects, 2) demonstrates the application of approaches to mixture characterization using real-world use cases, and/or 3) demonstrates approaches that integrate advancements in both chemical and biological characterization of mixtures.

Keywords:

Combined Exposure / Mixtures / Multiple Stressors

Molecular Toxicology

Chemical Sampling and Analysis

2. Aquatic Toxicology, Ecology and Stress Response

Assessing Contaminant Effects in Ecosystems With Multiple Stressors

David Ostrach, Cameron Irvine, Lawrence Kapustka

Aquatic ecosystems throughout the world are impaired and many are in a state of crisis due to multiple stressors where chemical mixtures and interactions with environmental factors are contributing to organism and population declines. Anthropogenic stressors such as chemical discharges from industry, agriculture, or treated urban wastewater can interact or be compounded by habitat degradation, invasive species, and other site-specific stressors (e.g., water diversions/controls or temperature). This is especially true for estuarine ecosystems where tributaries and major river systems converge with a high degree of human activity and where interrelated factors vary spatially and over time. Understanding the role and relative contribution of each stressor to causing adverse effects requires a good conceptual understanding of the ecosystem, chemical fate and transport, a significant wide ranging environmental data set, a breadth of analytical techniques, and a multi-disciplinary approach that invokes an integrated systems perspective. However, limited data often poses a challenge to identifying clear stressor-response relationships and robust statistical hypothesis testing. This emphasizes the need for higher quality and additional data, new data analysis methods, and integrated assessments of responses to multiple stressors. This session will focus on integrated assessments of multiple stressors and analyses of complex environmental data. Presentations will highlight lessons learned in the following areas: (1) research advances in the diagnosis or prognosis of toxic effects in multi-stress environments, (2) integrated assessment of environments receiving multiple stressors, and (3) implications for ecosystem management (case studies for applications).

Keywords:

Aquatic

Combined Exposure / Mixtures / Multiple Stressors

2. Aquatic Toxicology, Ecology and Stress Response

Canada's Oil Sands Mining and Dilbit Pipelines

Richard Frank, Alison Holloway

Over the past several decades, development of Canada's oil sands resources has expanded in northern Alberta and the transportation of diluted bitumen (dilbit) has expanded throughout North America, necessitating ongoing assessment of the potential for impacts on regional, terrestrial and aquatic ecosystems. Also, continual improvement in understanding of the toxicological and chemical characterization of oil sands process-affected materials has led to advancements in the development of water treatment and reclamation strategies. This session is dedicated to the monitoring of the natural environment, the progress of treatment and reclamation strategies, and advancements in understanding the toxicity and chemical content of highly complex mixtures of natural and industrial bitumen-derived chemicals and dilbit.

Keywords:

Oil and Gas

Environmental Monitoring

Ecological Risk Assessment

2. Aquatic Toxicology, Ecology and Stress Response

Contaminant and Trace Element Biogeochemical Cycling in Aquatic Ecosystems

David Walters, Jacqueline Gerson, Collin Eagles-Smith

A core piece of aquatic biogeochemistry has been the study of nutrient cycling in freshwater systems, while contaminants and trace elements have received much less attention. Contaminants such as arsenic, mercury, microplastics, and PFAS are toxic at low concentrations and continue to cycle at elevated levels due to anthropogenic activities. Other trace elements such as selenium and iron are important to aquatic biota at low concentrations but can be harmful at higher levels. The fates of contaminants and trace elements are controlled by the chemical properties of the element, as well as the biological, geological, and chemical environment, which determine exposure and contamination risk. This session will focus on measuring and modeling the transport, loading, and transformation of contaminants and trace elements in aquatic ecosystems. We also encourage submissions that focus on how landcover change, climate change, and other human impacts are changing the biogeochemical cycling of these contaminants and trace elements. Presenters considering this session are encouraged to see the related session on contaminant ecology before deciding which is the better fit for their research.

Keywords:

Toxins

Freshwater

Aquatic

2. Aquatic Toxicology, Ecology and Stress Response

Freshwater Salinization and Major Ion Toxicity: Causes, Effects, and Working Towards Solutions

David Soucek, Patricia Gillis, Bryant Serre, William Adams

With the concentrations of major ions in freshwater systems increasing globally, the ecological impacts of salinization are of pressing concern. Despite natural processes contributing to the salinization of freshwaters, many human activities, such as road de-icing, resource extraction, agricultural practices, and wastewater effluents, may be responsible for accelerating the rate and scale at which it is taking place. Rising ion concentrations can reduce biodiversity, alter ecosystem function, trigger a shift toward salt-tolerant freshwater species, and increase the risk of invasive estuarine species. Contamination of drinking water sources with salt has raised concerns over the human health risks associated with salt intake and could eventually lead to increasing drinking water treatment costs. Some jurisdictions manage salinity only as it relates to drinking and irrigation waters; however, this does not necessarily protect biodiversity. Other jurisdictions with aquatic life criteria manage salinity based on either a single ion (e.g. chloride) or total salinity. Each approach has its challenges ranging from managing areas with naturally elevated salinity, to the inherent complications of regulating co-occurring ions with varying toxicities. However, there is a pressing need to develop and implement robust water quality regulations to protect freshwater life and ecosystem services before the situation likely worsens. Climate change is expected to exacerbate salinization by causing seawater intrusion in coastal freshwaters, increasing temperatures and evaporation, and reducing precipitation in some regions. Human activities will continue to generate saline effluents and runoff at the same time as an increase in demand for freshwater is predicted to reduce the capacity of surface waters to dilute.

This session highlights the latest research on: i) the causes and extent of freshwater salinization, with a focus on global advances in field- and modelling-based ion fate and transport studies; ii) the effects of salinity and major ion mixtures on single organisms, communities, and ecosystem services; and iii) approaches to mitigate freshwater salinization, including predictive models for salt toxicity, new approaches to establishing regulatory standards for salinity, and management measures to reduce the impacts of salts on freshwaters, including the ecological consequences of using alternatives for de-icing roads.

Keywords:

Freshwater Salinization

2. Aquatic Toxicology, Ecology and Stress Response

From Lab to Nature: Applying Environmental Relevance to Standardized Toxicity Testing.

Tamzin Blewett, Connor Stewart, Sienna Overduin

This session will focus on issues related to the adaption of lab-based standardized toxicity testing (Environment Canada, US EPA, OECD guidelines, etc.) to the environment we seek to model during ecotoxicity studies. A large proportion of ecotoxicity studies are performed in tightly constrained laboratory conditions in accordance with reference test guidelines. This removes many factors from experiments that could influence the sensitivity of an organism to a toxicant and may result in findings that deviate from environmental outcomes. By understanding what our standard lab tests may be missing, we can identify how we can adapt our risk assessment practices to better consider these deviations from environmental outcomes, and how we as scientists can improve this disconnect within the field.

This session aims to highlight research that has been performed in a manner that increases the applicability of data generated towards environmental outcomes, with the intention of promoting a broader discussion of if standardized test guidelines should be updated to reflect recent advances in knowledge regarding the applicability of lab-based research. While this session may attract discussion on hypothetical methodology studies, our primary focus is to highlight studies which have gone beyond the standard lab model, allowing for a direct comparison of the differences in outcomes between standard lab tests and experiments incorporating additional environmental relevance/stressors (e.g., seasonal changes, sociality, multiple stressors, pathogens, wild species, etc.).

Keywords:

Risk Assessment

Aquatic

2. Aquatic Toxicology, Ecology and Stress Response

General: Aquatic Toxicology, Ecology and Stress Response

This session will cover issues related to ecology, ecotoxicology and response to stress of all aquatic systems, including lentic and lotic freshwater systems, estuaries, coastal and marine environments.

This session will be poster only.

Keywords:

General

2. Aquatic Toxicology, Ecology and Stress Response

Global Biodiversity and Ecosystem Functioning Responses to Chemical Pollution

Brittany Perrotta, Austin Gray, Jose Rodriguez Gil, Meredith Seeley

Chemical pollution that has entered the biosphere has had a wide range of adverse effects on aquatic and terrestrial ecosystems. As chemical pollution has increased 50-fold since the 1950s, we have seen organismal impacts that are both lethal and sublethal. Despite the long-documented history of chemical or contaminant impact on non-target organisms, they are rarely tied to ecosystem-level effects. Whether directly or indirectly, contaminants can influence ecosystems at multiple levels of biological organization. They may also act as a co-stressor with other anthropogenic stressors (e.g., other contaminants, habitat manipulation, climate change) or naturally present environmental stressors, such as pathogens. As biodiversity declines, it is important to highlight how pollution has influenced this, as it

has been long disregarded in traditional discussions. We must recognize that contaminants are linked to human activity and affect biota, and effects are apparent globally and thus should be recognized as agents of global change. To understand ecosystem-level effects, our research should focus on organisms that inhabit geographical areas and also understand how ecosystem processes and functions may be altered (e.g., nutrient cycling, biogeochemistry, secondary production). This session aims to bring together the fields of ecotoxicology, ecosystem toxicology, and ecosystem ecology to unify our efforts to understand the broader impacts chemicals or contaminants have on the planet. Examples of whole ecosystem research projects can include micro- or mesocosms that incorporate multiple levels of biological hierarchies or large-scale ecosystem manipulations (e.g., whole-lake studies). Model systems to represent larger ecosystem functions are also of interest. In addition, field monitoring approaches could be considered when specifically designed to address the direct effect of a clear contaminant source (e.g. contaminated effluent)

Keywords:

Ecosystem Service

Environmental Effect Models

Combined Exposure / Mixtures / Multiple Stressors

2. Aquatic Toxicology, Ecology and Stress Response

Novel Methods and Approaches for Assessing Effluents and Ambient Water Toxicity

David Soucek, Camille Flinders, William Goodfellow, Tham Hoang

Whole Effluent Toxicity Testing (WET) and Whole Effluent Assessment (WEA) have been used to evaluate wastewater and ambient water toxicity since the 1940s. Use of WET/WEA are environmentally relevant, because such approaches consider the aggregate effects of complex contaminant mixtures found in effluents and receiving waters. Most WET/WEA methods used in North America and Europe are based on standard test species that have proven reliable in producing predictable and reproducible toxicity estimates. The application of effect-based methods (EBM) is advancing in Europe with methods that include in vivo and in vitro assays. EBM include short term, chronic in vivo trout methods that have the potential to be more appropriate for evaluating effluents discharged to cold waters, and assays with vertebrate embryos (fish and amphibians, e.g. FET and AMPHITOX) that consider the principles of the 3R's (Replacement, Reduction and Refinement) for animal welfare as well as the high susceptibility of early life stages to noxious agents. In addition, EBM may be more suitable than traditional assay approaches for evaluating substances with multiple Modes of Action (MoAs) that potentially have agonistic, antagonistic, or synergistic effects. One example of the EBM monitoring approach uses in vitro tests to assess risk from estrogenic substances such as 17β-estradiol (E2) and 17α-ethinylestradiol (EE2). Use of behavior testing, such as the 24 h post-fertilization (hpf) with zebrafish test is being used in High Throughput Testing (HTS). In the US, new WET short-term chronic methods are being explored using three invertebrate species, a mayfly (Neocloeon triangulifer), a mussel (Lampsilis siliquoidea) and the benthic species, Hyalella azteca, and a fish (brook trout, Salvelinus fontinalis). This session will focus on approaches using new test species and methods that may be more ecologically relevant, geographically representative, and/or sensitive than existing standard test organisms and/or approaches, that could be considered sentinel organisms for water quality protection. This session will also focus on new approaches that overcome the mixture effects of whole effluents, and consider other MoAs, estrogenicity, neurotoxicity, genotoxicity, and teratological effects that are often relevant for human health assessment.

Keywords:

Water Quality

Environmental Effect Models

Aquatic

2. Aquatic Toxicology, Ecology and Stress Response

One Health of Planktonic, Pelagic and Benthic Harmful Algal Blooms (HABs): The Detection, Fate, Effects, Monitoring, and Management of Blooms

Alan Wilson, Dawn Perkins, Avery Tatters, James Lazorchak

Marine and freshwater harmful algal blooms (HABs) are defined as an assemblage of eukaryotic or prokaryotic plankton that have the potential to produce toxins and deleterious conditions, as well as cause negative human health, ecological, or socioeconomic impacts. Such impacts include, but are not limited to, changes in physiochemical parameters, decreased aesthetics, release of toxins, and alterations in food web interactions. Major routes of exposure, in assessing human health risk, are via contaminated drinking water, recreational waters, air, and food. More recently, the potential threat of epiphytic/benthic (attached and/or buried) toxin-producing cyanobacteria has garnered attention due to effects on humans, pets, and wildlife. However, there are still many uncertainties about planktonic and benthic algae, including prevalence; relative abundance; the nature of their life stages; toxin and metabolite profile; and risk to human, aquatic, and terrestrial life. What are the current knowledge gaps related to the proliferation of epiphytic/benthic algae? What research is required to address these gaps, particularly across the freshwater to marine continuum? Do we have enough knowledge to develop in situ and water treatment mitigation plans as well as predictive models? What tools are available to track and monitor algae and their associated toxins in freshwater and marine environments, and are there new tools that can be used to achieve environmental protection goals? Are there effective early warning tools for significant toxic events? How can advances in various methods help with analysis and identification of emerging toxins? How can we better approach toxicity assessments for humans, wildlife, pets, and aquatic organisms? How do mixtures of toxins, exposure routes, and molecular mechanisms impact toxicity? How should we best incorporate 'omics techniques into HABs research? What are the current regulations and what guidance is available to address benthic and pelagic HABs and their toxins? What are the difficulties in managing the conditions that contribute to toxin production, release, and exposure? To help address these questions, presentations on the distribution, detection, identification, and health endpoints and pathways of exposures on public and tribal lands are of interest; especially, in relation to the development of additional management tools and approaches to reduce occurrence and improve response to HABs issues, from genes to satellites.

Keywords:

Environmental Exposure

Molecular Toxicology

Toxins

2. Aquatic Toxicology, Ecology and Stress Response

Paint Microplastics: Sources, Fate, and Ecotoxicological Effects in Aquatic Ecosystems

Zoie Diana, Madeleine Milne, Chelsea Rochman

Paints from roads, buildings, boats, and the built environment have recently been modeled to be a large source of microplastics to the environment. Although not frequently discussed in broad conversations regarding microplastics, paints can generate microplastics. Paints often contain plastic binders (e.g., acrylic, alkyd, polyurethane) - connecting the paint's pigment to other chemical constituents. On average, paint microplastics are expected to contain a greater percentage of chemical additives than non-paint microplastics, and warrant their own ecotoxicological examination. Although many studies have documented the ecotoxicological effects of historic (and some modern) antifouling coatings/paints, little is known regarding the effects of building, road, and artistic paints. In general, the field of paint microplastics is new and we still have a lot to learn about paint microplastic contamination in the environment, its fate in aquatic ecosystems, and ecotoxicological effects on resident animals. This session will highlight research that fills this gap. The knowledge shared in this session will aid in determining the state of the science on paint microplastics and key research gaps to fill in the coming years.

Keywords:

Plastics (Micro- or Nano-)

Aquatic

2. Aquatic Toxicology, Ecology and Stress Response

Stormwater Runoff Impacts, Solutions, and Innovative Research

Kevin Rader, Kenneth Schiff, Jenifer McIntyre, Sara Hutton

Stormwater runoff is known to contain a wide variety of traditional toxic chemicals and emerging contaminants of concern such as 6PPD-quinone, microplastics, and PFAS. Compounded by changes in flow and habitat, stormwater runoff is one of the most difficult types of pollutant discharges to control. There is a large volume of ongoing research to determine the sources, transport pathways, bioavailability, and ultimate environmental fate and toxicity of stormwater pollutants. Research on innovative treatment options, performance of best management practices (BMPs), operations and maintenance to prolong performance, and shifting baselines due to climate change has been progressing on a parallel track. This session aims to coalesce stormwater researchers - chemists, toxicologists, biologists, hydrologists, risk assessors, environmental engineers, as well as regulators and stakeholders - to discuss recent advancements and challenges in the characterization, mitigation, and management of traditional and emerging contaminants in stormwater. The inter-disciplinary research necessary to resolve the many complex problems associated with stormwater requires effective communication and interaction if SETAC is going to provide leadership for improving runoff water quality and mitigate impacts to receiving waters.

Keywords:

Water Quality

Combined Exposure / Mixtures / Multiple Stressors

Aquatic

3. Wildlife Toxicology, Ecology and Stress Response

Beyond the Deepwater Horizon: Recent Wildlife Petroleum Ecotoxicology Research and the Path Ahead

Mason King, Christopher Goodchild, Katherine Horak, Ryan Takeshita

Wildlife such as birds and marine mammals are highly vulnerable to petroleum releases, and typically include legally protected species. Wildlife are accordingly a prominent feature of statutory natural resource injury frameworks. One recent example, the Deepwater Horizon oil spill (2010), precipitated perhaps the largest wave of wildlife petroleum ecotoxicology research to date, driven in large part by multi-institutional collaborations coordinated by the resulting US Natural Resource Damage Assessment (NRDA). Fourteen years after the incident, that body of research is still being published and continues to develop our understanding of petroleum toxicity in vertebrate wildlife (i.e. reptiles, amphibians, birds and mammals). This session seeks to feature studies about petroleum exposure and effects in wildlife, for instance exposure rate estimates, thermoregulation, toxic effects, and more complex effects mediated by behavior, habitat use, food webs, and spill response measures. Furthermore, research on comparatively less studied inland freshwater and terrestrial wildlife habitats is invited.

Even when research funding is available through oil spill resource injury frameworks like the Deepwater Horizon NRDA, it can be difficult to describe and quantify how sub-lethal effects result in changes to survival and reproduction over longer time scales, especially without sufficient baseline data, and data gaps remain in adverse outcome pathways linking exposure, mechanism, individual response, and population-level effects to characterize and calculate resource damage. For future oil spill events, ad hoc field studies on wildlife effects will be more powerful with pre-spill monitoring data in-hand and with insight from complementary and strategically conceived lab and field experiments. Therefore, this session will seek to provide a contemporary snapshot of work on the longstanding research topic of petroleum effects in wildlife in order to synthesize a vision for coherence and priority among ongoing and future work.

Keywords:

Oil and Gas

Wildlife

3. Wildlife Toxicology, Ecology and Stress Response

General: Terrestrial Toxicology, Ecology and Stress Response

Presentations in this sessions will discuss ecology and toxicology of all life forms of wildlife not strictly aquatic (amphibian, reptile, birds and mammals and other organisms) living in areas from the deserts to the tropics and everything in between.

This session will be poster only.

Keywords:

General

3. Wildlife Toxicology, Ecology and Stress Response

Integration of 21st Century Approaches to Wildlife Risk Assessment for Pesticides in North America

Thomas Bean, Christy Morrissey, Connie Hart

The focus of this session will be on wildlife risk assessments performed for synthetic pesticides/traditional chemistries in North America where risk assessment frameworks have remained nearly static for decades. For example, reliance on use of no-observed effect level (NOEL) in chronic studies, use of median Kenaga nomogram values in the United States (last updated in Fletcher et al. in 1994) to predict residues and life history assumptions from the US EPA's 1994 wildlife exposure handbook. Pesticide risk assessment frameworks for wildlife in North America currently do not exist for taxa such as reptiles, amphibians, aerial insectivores, and marine mammals. By comparison, pesticide risk assessments in the European Union for terrestrial vertebrates will become increasingly complex when the new draft European Food Safety Authority's (EFSA) guidance of 2023 is noted by the European Commission. The proposed EFSA guidance integrates new data, new approaches and the flexibility to integrate approaches such as toxicokinetic/toxicodynamic (TKTD) modeling that are not currently validated (but may well be before the next guidance update) into their revised guidance document. At the upcoming 34th SETAC Europe meeting to be held in Seville, Spain (Spring 2024), a session was proposed on implementation of modern approaches in risk assessments for birds and mammals in Europe. Here, we propose a session focused on a similar theme to the one proposed for SETAC EU, but instead looking specifically at what could and perhaps should be done in North America (in terms of incorporation of modern approaches) for wildlife risk assessment for pesticides. This session solicits contributions that could be either used to update underlying data used in pesticide risk assessments for wildlife, improve accuracy of risk assessments, expand the scope of what is currently possible, or reduce, refine, or even replace vertebrate studies.

Keywords:

Pesticides /Plant Protection Products

Ecological Risk Assessment

Wildlife

3. Wildlife Toxicology, Ecology and Stress Response

Let's Talk About Snakes, Baby! (And Frogs, Lizards, Salamanders, and Turtles Too...)

John Marton, Catherine Aubee, Céline Godard

Amphibians and reptiles represent a particularly sensitive group of ecological receptors, with amphibians being arguably the most threatened vertebrate group in the world and reptiles the most data deficient. Declines have resulted from complex factors including habitat loss and destruction, chemical pollution, invasive species, disease, and more. Despite increased public awareness and protections from policies and laws at different scales of government, these declines continue at an alarming rate. Research across multiple disciplines remains important to advance our understanding of the relationship between environmental stressors and biodiversity loss, and to elucidate downstream effects on other organisms and ecosystems. This session will connect experts from various scientific fields and sectors who seek to understand, assess, and mitigate threats to amphibian and reptile biodiversity. We invite presentations that explore advances and challenges in overlapping areas of amphibian and reptile physiology, ecology, and ecotoxicology that relate to biodiversity loss and recovery efforts. We welcome presentations based on lab, field, in-silico, and combination approaches. Examples may include case studies; discussion of regulatory approaches to reptile and amphibian biodiversity protection; contaminant effects on within- and across-species interactions; epidemiology of reptile and amphibian disease; advances in monitoring and population ecology; as well as more traditional ecotoxicology presentations (exposure and hazard estimation, behavioral and physiological responses, individual or multiple stressors, and modelling across spatial and temporal scales).

Keywords:

Amphibians and Reptiles

Wildlife

3. Wildlife Toxicology, Ecology and Stress Response

Unraveling the Nexus of Chemicals Management and Biodiversity Loss

Sarah Hughes, Adriana Bejarano

Chemical pollution, arising from industrial processes, agriculture, and urbanization, poses a significant threat to ecosystems worldwide. As pollutants infiltrate air, water, soil and sediments, they interact with living organisms, disrupting the ecological balance, and endangering biodiversity. In accordance with global efforts to reduce the negative impacts of chemicals on biodiversity, many governments are setting ambitious goals for mitigating the entry and effects of chemicals in the environment. However, these goals are hindered by unclear definitions, metrics, and relationships of biodiversity with chemical regulation. As the world moves towards unifying goals of environmental stewardship, emerging frameworks (e.g., The Global Biodiversity Framework, The Essential Biodiversity Variables) are helping to consolidate these definitions and metrics. This alignment will be vital to ensuring that chemical regulations and prescribe risk assessment approaches fully align with those goals. This session aims to explore the intricate links between chemical contaminants and their impacts on various levels of biological diversity. We are seeking submissions on research and case studies investigating how chemical exposure affects individual species, populations, and entire ecosystems. We aim to engage tri-partite perspectives from diverse fields of ecology, toxicology and policy in a lively discussion and fostering interdisciplinary collaboration towards chemical management solutions. By understanding the intricate web of chemical pollution and biodiversity loss, we can develop informed strategies to protect our planet's natural heritage.

Keywords:

Wildlife

3. Wildlife Toxicology, Ecology and Stress Response

Wildlife Toxicity: Innovative Approaches for Evaluating Exposure and Effects of Contaminants in Free-Ranging Wildlife and Laboratory Animal Models

Kailee Hopkins, Beatrice Hernout, Natalie Karouna-Renier, Jonathan Sangiovanni

Innovative approaches to understanding exposure and the effects of chemicals on wildlife are essential for the development of ecological risk assessments. Such approaches are rapidly expanding, driven by scientific advances in areas like analytical chemistry, omics, and statistical ecology. Thus, researchers are increasingly encouraged to develop more efficient and cost-effective methods while also minimizing the mortality of the test species. Insights gleaned by these novel technologies will be crucial in providing information to comprehensively assess the risks posed by chemicals to wildlife in complex environments.

With this session, our objective will be to gather scientific work from across various disciplines that examine the exposure and effects of contaminants on both free-ranging wildlife and laboratory animals. Specifically, this session will focus on mammals, birds, fish, amphibians, and reptiles. We invite submissions that employ methodologies that are used to investigate exposure and effects of contaminants at multiple levels of biological organization, from cellular to organismal, population, or community levels.

Topics to be covered in this session include, but are not limited to: • Recently developed non-invasive and cost-effective techniques to evaluate contaminant exposure.

• Methods to assess exposure of contaminants in the field: remote sensing, mapping tools, etc.

• Modeling work used to predict exposure and/or effect on wildlife species.

• New exposure and/or effects biomarkers to be used in field studies and tested on laboratory animals.

Keywords:

Ecological Risk Assessment

Environmental Chemistry

Modeling

4. Chemistry and Exposure Assessment

21st-Century Challenges in Developing Countries

Beatrice Opeolu, Linda Sibali, Olatunde Olatunji, Faith Kandie

The 21st-century world faces numerous challenges, including poverty, corruption, diseases, political and sectarian violence, natural disasters, and population explosion. These challenges disproportionately affect developing economies, particularly in Africa, Asia and Latin America. Alongside these socio-economic issues, environmental concerns such as pollution of water resources have emerged as critical issues requiring urgent attention. Industrialization, urbanization, and population growth have intensified the pressure on natural resources, leading to water quality degradation. Ecosystems worldwide face pollution from various sources, including domestic, agricultural, and industrial activities. Organic and inorganic contaminants such as heavy metals, phenols, phthalates, PAHs, pharmaceuticals, PFOS, PFOA, and microplastics pose significant threats to human health and the environment. The effects of climate change in developing countries exacerbate these threats. These countries struggle with limited resources for measuring, monitoring, and remediating water pollution. Ineffective policy enforcement exacerbates these challenges, compromising the quality and public health of water resources. Urgent action is needed to address these issues and safeguard the well-being of communities.

Achieving a balance between economic growth and environmental sustainability requires concerted efforts and innovative solutions. Researchers are crucial in providing policymakers with the necessary data to make informed decisions. By focusing on the assessment, monitoring, and remediation of emerging contaminants in water, researchers can contribute to mitigating the adverse impacts of pollution and promoting sustainable development.

This session aims to bring together researchers, policymakers, and practitioners to discuss emerging contaminants in water and showcase innovative approaches to assessment, monitoring, and remediation. By sharing experiences and expertise, participants will have the opportunity to identify best practices, challenges, and opportunities for collaboration. The session also seeks to foster a network of researchers committed to addressing water pollution, with a focus on the African continent and beyond.

We invite submissions of research papers addressing the following themes: • Emerging contaminants in water: identification and characterization

• Innovative approaches to water quality assessment and monitoring

• Remediation technologies for contaminated water resources

• Policy implications and regulatory frameworks for addressing water pollution

• Case studies and experiences from different regions, with a focus on developing countries

By convening experts from diverse backgrounds, this session aims to catalyse collective action towards addressing the pressing issue of water pollution. Together, we can explore novel solutions, forge partnerships, and pave the way for a more sustainable future.

Keywords:

Plastics (Micro- or Nano-)

Water Quality

Environmental Monitoring

4. Chemistry and Exposure Assessment

Advanced Monitoring and Assessment Approaches for Improved Treatment of Contaminants of Emerging Concern and PFAS in Wastewater

Susan Glassmeyer, George Ruck, Mahsa Modiri Gharehveran, Marc Mills

Water treatment systems, especially in densely populated areas, are under increasing pressure. By 2050, it is projected that more than 2.5 billion individuals globally will be impacted by organic pollutants. A significant portion of these pollutants originates from municipal wastewater discharge and industrial activities. Many Contaminants of Emerging Concern (CECs) are poorly understood and require more attention, especially per- and polyfluoroalkyl substances (PFAS) in relation to their fate and transport in both wastewater discharge and sludge accumulation. PFAS are overwhelmingly found in water treatment plants (WWTP) and present a well-documented risk to aquatic ecosystems and groundwater due to their toxicity, widespread use, and high persistence.

To optimize WWTP efficiency, it is crucial to consider the intricate chemical interactions associated with CECs and PFAS, and to improve monitoring and pre-treatment techniques to pinpoint the sources of upstream pollutants. These strategies should encompass a wide range of CECs and PFAS, rather than focusing solely on a few chemicals. For instance, while advanced treatments like activated carbon filters may effectively remove regulated PFAS, serious question marks remain regarding the removal of less regulated but highly prevalent PFAS. This session will explore strategies such as (1) using spectrometry, chemometric, or effect-based methods to characterize CEC or PFAS dynamics in WWTPs, (2) further investigating the toxicity of lesser-known CECs and PFAS, and (3) developing guidance protocols that can transform wastewater utilities into systems that support population health monitoring through surveillance and monitoring strategies. This session will focus on advancements in detecting, treating, and managing CECs like PFAS in wastewater. We will explore potential solutions for improved monitoring of pollutant discharge, including non-targeted and retrospective analyses. Studies showcasing advanced treatment and pre-treatment strategies to identify major contributors of PFAS are also of interest. These studies are not only relevant for wastewater treatment but also for soil and crops when reusing treated water and sludge. We encourage submissions from experimental work at the laboratory, pilot, and field monitoring studies, as well as modelling of CEC and PFAS removal in pre-treatment, traditional, and advanced wastewater treatment systems to address chemical exposure risks.

Keywords:

PFAS

Water Quality

Chemical Sampling and Analysis

4. Chemistry and Exposure Assessment

Advances in Pesticide Application Technologies: Evolving Benefits and Environmental Challenges

Michelle Hladik, Scott Teed, Aileen Maldonado, Daniel Snow

Technological advances have the potential to improve the efficiency of applying plant protection products while reducing impacts on the environment. Drone sprayers, drift reducing nozzles and shields, robotics, RNA-based pesticides, artificial intelligence, seed coatings and precision drilling, and other advances may provide more efficient and environmentally friendly use of pesticides in modern agriculture and horticulture. For example, seed treatment technologies, designed to protect vulnerable young plants from insects and fungal diseases, can reduce the need for early season soil and foliar pesticide applications. Drone sprayers offer several advantages over traditional ground and aerial application methods including faster and more precise applications. RNA-based pesticides can selectively target pest species without posing risks to non-target species and are not as persistent as many chemical plant protection products in the environment.

This session will present environmental benefits, costs, and trade-offs of evolving agricultural technologies and how academics, industry, and governments can contribute to best practices. We will encourage presentations showing the latest research on advances in plant protection technologies with critical evaluations of their efficacy, advantages, costs, and disadvantages. Environmental challenges can address disposal issues, as well as off-site movement, fate, transport, and exposure to active ingredients. If used properly, advances in adoption of plant protection technology can contribute significantly to the sustainability of global agricultural systems.

Keywords:

Environmental Chemistry

Environmental Exposure

4. Chemistry and Exposure Assessment

Bridging the Gap Between the Unknown and the Known for PFAS Analysis

Karl Oetjen, Juliane Brown, Natalia Soares Quinete

Non-targeted and targeted workflows are foundational for understanding the impact of emerging compounds of concern, including PFAS, in the environment. Recent advancements in analytical instrumentation and data processing approaches have paved the way for the discovery of a growing number of PFAS structures in a variety of matrices using nontargeted analysis (NTA) techniques. However, the process of transitioning from an unknown feature to a known compound with a quantifiable concentration is often challenging. The lack of analytical standards, detailed structural information, comprehensive open access mass spectral libraries, and comprehensive analytical methods limit the ability to fully utilize NTA data for toxicological and environmental research. Furthermore, the inability to ensure data quality, lack of comparability between laboratories, data management challenges, and lack of understanding of the utility of NTA data inhibit widespread adoption. The scientific community has developed strategies to address some of these issues, using tools such as suspect list screening approaches, computational chemistry methods involving quantum mechanics, adjustments to chromatography conditions, confidence reporting, and semi-quantitative analysis. This session will provide a forum for discussing the current state of PFAS NTA, as well as the experimental and data processing approaches needed to fully utilize this data to address current challenges across the scientific community. Additionally, the session will allow researchers to share experiences regarding the steps and effort required to go from an unknown feature to a reportable or semi-quantifiable result, while highlighting methodologies that they found the most helpful.

Keywords:

PFAS

Environmental Chemistry

Chemical Sampling and Analysis

4. Chemistry and Exposure Assessment

Challenges in PFAS Analyses and Detection

Lilit Ispiryan, Helmer Korb

Per- and polyfluoroalkyl substances (PFAS) have garnered significant attention due to their persistence, bioaccumulation, and potential health risks. This session aims to bring together experts from diverse fields to discuss the multifaceted challenges associated with PFAS analyses ultimately aiming to advance our understanding of PFAS contributing to effective environmental and health management.

We will delve into the complexities of analyzing PFAS in various matrices, explore state-of-the-art and novel techniques for sample preparation and detection, and address the evolving landscape of analytes and detection limits. Key topics will comprise for instance matrix diversity: PFAS occur in a wide range of matrices, including water, soil, biological matrices or food. We invite experts to will share their experiences in handling these diverse sample types and the unique challenges they pose. In this context efficient sample preparation is crucial for accurate PFAS analysis. Presenters will discuss extraction methods, such as solid-phase extraction (SPE), and matrix-specific considerations. Especially time- and resource efficient automated techniques supporting more accurate and sustainable lab-practices are increasingly in demand. From liquid chromatography-mass spectrometry (LC-MS) to high-resolution mass spectrometry (HRMS), the most appropriate and precise PFAS detection techniques will be discussed, while addressing challenges related to selectivity, sensitivity, and interference.

Furthermore, the list of routinely analyzed compounds from the PFAS family continues to expand. New compounds are discovered or known compounds are added due to their recently recognized significance. The challenges of keeping up with this ever-growing list of analytes should be addressed. As importantly, regulatory requirements demand lower detection limits. Speakers are invited to share strategies for achieving ever-decreasing detection levels while maintaining analytical accuracy and robustness.

Keywords:

PFAS

Water Quality

Soil

4. Chemistry and Exposure Assessment

Data Curation Approaches: Collecting, Organizing, and Validating Chemical Information To Ensure Its Accuracy, Reliability, and Usefulness To Build Qsars in Order To Support Private-Public Regulatory Partnerships

Mary Kawa, Wen-Hsiung Lee, Lauren Cassidy

High-quality data sets of robust and reliable chemical information are needed to support regulatory and research activities, such as informing chemical hazard assessments and developing models based on Quantitative Structure-Activity Relationships (QSARs) and artificial intelligence (AI) machine learning (ML) methods. Generating data and information to support regulatory approvals in the global chemical industry sector is moving away from conducting testing in vertebrate animals. Under Section 4(h)(1)(B)(i, ii, and iii) of TSCA, EPA is required to encourage and facilitate "Scientifically valid test methods and strategies that reduce or replace use of vertebrate animals while providing information of equivalent or better scientific quality and relevance that will support regulatory decisions." Therefore, partners in; private industry, NGOs, academia, and public agencies are looking to models and other New Approach Methods (NAMs) to provide useful chemical information to fulfill regulatory needs. To support the pipeline of data generation suitable for use in models and chemical assessments, data collection efforts need to apply with sound data management approaches, robust scientific rationale, and expertise in data interpretation.

This session focuses on the current paradigms of model development and validation with a special focus on data curation. Presentations on collecting, organizing, cleaning, maintaining, and validating chemical information and tools used to curate datasets are highly relevant. Further, abstracts on associated scientific data policies, guidance, documentation, and other evaluation considerations are welcome.

Disclaimer: The contents in this abstract do not reflect EPA policy or endorsement

Keywords:

Predictive Toxicology

Regulatory Science

Risk Assessment

4. Chemistry and Exposure Assessment

Domestic, Agricultural, Landfill and Industrial Waste: Occurrence, Fate, and Effects of Contaminants

Bharat Chandramouli, Gerald Tetreault, Jennifer Guelfo

Management systems for domestic waste (i.e., on-site and municipal wastewater, and municipal landfills), agricultural waste and runoff, and industrial waste such as produced water from hydraulic fracturing operations legacy and current landfill operations represent major potential sources and vectors of chemicals to the environment. These wastes are complex mixtures of nutrients, salts, metals, microbes, and various organic chemicals including certain contaminants of emerging concern (CECs) (e.g., pharmaceuticals and illicit drugs, personal care products, per- and poly-fluoroalkyl substances (PFAS), flame retardants, plasticizers, solvents), naturally occurring radioactive materials (NORM), oil derivatives, glycol polymers, ethoxylated alcohols, quaternary ammonium compounds and likely many others still yet unreported. The chemicals themselves may perturb human and ecological health but also offer the ability to serve as tracers for tracking waste co-contaminants. In addition, studying the partitioning of substances between the liquid and solid waste streams as well as transformation can provide insight into environmentally relevant physicochemical properties and fate. Waste and waste-impacted environments are challenging to study, confounded by the huge number and diversity of chemicals, complex sample matrices, and influence of transport and fate mechanisms. This session will aim to highlight advancements in the techniques and approaches being used to improve our understanding of chemicals (particularly CECs) in domestic, agricultural and industrial wastes. Research topics covered in this session include the occurrence and fate of these chemicals, their use as tracers to probe fate, transport, , and physicochemical properties, characterize effects on biota exposed to waste in the receiving environments, and how emerging treatment methodologies affect contaminant occurrence and fate. We invite research covering the broad range of sources and pathways including municipal wastewater treatment systems, landfills, agricultural sources and runoff, and industrial sources such as produced water, as well as less conspicuous releases including on-site septic systems, wastewater lagoons, leaking sewers, historic landfills, and the land application of sludge and biosolids.

Keywords:

Chemical Sampling and Analysis

Plastics (Micro- or Nano-)

Environmental Chemistry

4. Chemistry and Exposure Assessment

Environmental Fate of Polymer

Vurtice Albright, Boya Xiong

Rapid growth in global demand for conventional and biobased or biodegradable polymers has resulted in increased attention on their environmental fate by the academic, industrial, and regulatory communities. Researchers need to overcome additional challenges when assessing the environmental fate of polymers compared to nonpolymers. Prospective presenters are encouraged to submit abstracts covering relevant topics on the environmental fate of polymers such as: advancement of new or modified test methods for conducting polymer environmental fate studies; new or modifications of existing analytical techniques for tracking polymer degradation in various environmental matrices; environmental monitoring studies; novel abiotic and biotic degradation mechanisms and pathways; and novel biodegradable polymers.

Keywords:

Pollinators

Environmental Chemistry

4. Chemistry and Exposure Assessment

Fate and Effects of Metals: Biogeochemical Perspective

Kevin Rader, Richard Carbonaro

Metal fate and effects are determined by a combination of biogeochemical factors including release mechanisms, speciation, partitioning, precipitation/dissolution reactions, and interactions with biota. Research over the past decade has broadened our knowledge of these different processes. However, understanding which processes dominate in a given exposure environment remains a challenge, particularly when dealing with chemical mixtures. The purpose of this session is to highlight current research directed at understanding biogeochemical processes that control metal fate and effects in terrestrial, surface water, and sediment environments.

Topics that will be addressed in the session include: (i) new techniques for measuring metal speciation in aquatic systems, (ii) modeling tools for describing the geochemical behavior in sediments and overlying waters, (iii) mechanisms for metal transformation and immobilization including impacts from biota, (iv) metal interactions with relevant binding phases such as natural organic matter and mineral surfaces, and (v) application and validation of models using data from field sites. Key questions this session will attempt to answer include: What is being (or can be) done to increase our ability to predict metal speciation quantitatively? Are more mechanistic chemical descriptions required to adequately describe fate and effects of metals in the environment? Or can less mechanistic models be used to predict effects in risk assessment and regulatory contexts? And finally, what roles do terrestrial and aquatic/benthic organisms, including microbes, play in the overall cycling of metals in the environment?

Keywords:

Metals and Metalloids

Environmental Chemistry

Modeling

4. Chemistry and Exposure Assessment

General: Chemistry and Exposure Assessment

Presentations focused on chemical analysis, monitoring, fate and modeling, green chemistry and alternative chemical assessment are invited to this session.

This session will be poster only.

Keywords:

General

4. Chemistry and Exposure Assessment

Identifying and Linking Environmental Exposure to Biological Effects

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.

Keywords:

OMICs

Adverse Outcome Pathways

PFAS

4. Chemistry and Exposure Assessment

Legacy And Emerging Pollutants in The Environment: Current Trends in The Developing World

Beatrice Opeolu, Ntebogeng Mokgalaka, Professor Chioma Chikere

The rapid growth of the global population, particularly in poor regions, has led to an increased demand for essential resources such as food, shelter, and goods, placing significant pressure on natural ecosystems, especially aquatic environments. While resource extraction activities contribute to economic development and improved living standards, they also threaten human health and ecological balance.

As water scarcity and climate change-induced events such as droughts, famines, wildfires, floods, and diseases become more severe, the strain on natural resources escalates, particularly in developing nations that often lack adequate adaptation strategies and technologies. Therefore, it is imperative to prioritize the investigation and promotion of sustainable resource management practices. Aquatic ecosystems face numerous challenges from pollutants, including heavy metals, phenolic compounds, polycyclic aromatic hydrocarbons, perfluorinated compounds, and various forms of plastics. These pollutants enter the environment through agricultural runoff, industrial discharge, wastewater, and household products, posing risks to ecosystem health and human well-being.

For instance, plastics can harm aquatic organisms' digestive, respiratory, and locomotive systems, while persistent organic pollutants adhering to plastics can disrupt ecological processes. Furthermore, contaminants' cumulative and synergistic effects within food webs raise concerns about their impact on the ecosystem and human health. Human health risks associated with contaminants range from irritation of the eyes and respiratory tract to more severe issues such as birth defects, liver dysfunction, and the release of endocrine-disrupting compounds. Moreover, many contaminants are potential carcinogens and can affect insulin resistance, reproductive systems, and brain function.

While traditional water quality assessments focus primarily on chemical analyses, they often overlook contaminants' additive, synergistic, or antagonistic effects and their bioavailability. Therefore, this session welcomes abstracts that delve into current knowledge, effects, and exposure assessments of legacy and emerging pollutants in developing countries. Given the environmental persistence of legacy contaminants and potential health risks associated with contaminants of emerging concern (CECs), conducting comprehensive risk assessments is crucial. This session welcomes research on various aspects of risk assessment, including hazard characterization, effects and exposure assessments, policy considerations, and risk management strategies.

By fostering collaboration among experts and stakeholders, this session aims to contribute to developing effective policies for managing contaminants in developing countries, and Africa in particular. The goal is to minimize their adverse ecological and human health impacts. Furthermore, it seeks to stimulate discussions on the future of Ecological Risk Assessment in Africa, providing valuable insights and guidance for future research and policy initiatives.

Keywords:

Human Health

Ecological Risk Assessment

Environmental Monitoring

4. Chemistry and Exposure Assessment

Mercury Bioaccumulation and Effects on Wildlife: Ecological Pathways, Cycling, and Risk

Sarah Janssen, Josh Ackerman, Matthew Chumchal, Collin Eagles-Smith

Mercury (Hg) is a ubiquitous, global contaminant that readily bioaccumulates in food webs and often has deleterious impacts on wildlife and human health. The goal of this session is to describe the ecological movements and effects of mercury in the environment, including the ecological pathways, physiological transformations, and effects of Hg within individuals, populations, and ecosystems. Understanding Hg bioaccumulation is further complicated by global changes in land cover, biodiversity, and other co-occurring stressors such as infectious diseases in wildlife populations. This intersection of Hg sources, ecological pathways of mercury bioaccumulation, and global change results in the need to enhance spatial and temporal datasets for biological Hg concentrations and further examine mechanistic processes, such as detoxification, that alter the potential for injury in animals. This knowledge is vital to the ongoing effectiveness evaluation of the U.N. Minamata Convention on Mercury, which seeks to evaluate long-term changes in wildlife Hg concentrations in response to global reductions in Hg pollution. In this session presentations focused on studies of Hg methylation, bioaccumulation, toxicity, and wildlife exposure assessment are welcome.

Keywords:

Bioaccumulation

Wildlife

Metals and Metalloids

4. Chemistry and Exposure Assessment

Methods for Assessing Environmental Fate and Effects of Difficult-To-Test Substances

Yunzhou Chai, Will Backe, Amanda Brennan, Amber White

Difficult-to-test substances may be volatile, reactive/unstable, or poorly/sparingly water-soluble substances, UVCBs (unknown or variable composition, complex reaction products or biological materials), surfactants, polymers, substance with unknown metabolites, or particles. The challenges in the determination of the environmental fate and effects of difficult-to-test substances may manifest in different ways: maintaining constant nominal exposure concentrations for assays, overcoming bioavailability limitations, extracting and quantifying analytes in complex environmental and biological matrices (difficult-to-measure), identifying unknown constituents or metabolites, differentiating toxicity from parent versus degradation products, etc. In this session, presenters are invited to share advancements in methodologies for conducting toxicity and environmental fate studies, analytical techniques for detection and characterization, and/or a framework/approach for assessing the environmental fate and effects for any type of the difficult-to-test substances.

Keywords:

Chemical Sampling and Analysis

Environmental Chemistry

Aquatic

4. Chemistry and Exposure Assessment

Navigating Environmental Assessments for Evaluating Consumer Products and Chemicals of Concern

Alexandra Gobeil, William Goodfellow

Regulatory requirements surrounding per- and polyfluoroalkyl substances (PFAS), bisphenol A (BPA), chemical filters in sunscreens, and other "chemicals of concern" in consumer products are accelerating rapidly both in the U.S. and globally. Increasing in tandem is consumer pressure for companies to reformulate their products with environmentally friendly and sustainable materials. As a result, companies across various industries such as apparel, cosmetics, home goods, and electronics are scrambling to audit their supply chains, product compositions, and manufacturing processes to remain in compliance and good consumer standing.

Integral components of these audits include identifying suitable science-based targets for assessing environmental impacts of manufacturing processes and supply chains, determining appropriate chemical analysis techniques for the products, finding suitable alternatives, and communication of risk with suppliers, regulators, and consumers - all of which come with numerous challenges.

This session aims to present case-studies and research related to the assessment of chemicals present in consumer products, the challenges with assessing these chemicals or products from an environmental perspective, and meeting both regulatory requirements and consumer desires for the use of more environmentally friendly and sustainable materials. Presentations on assessing toxicity, analysis methods, sustainability goals, and strategies for navigating the changing regulatory landscape of consumer products are highly encouraged.

Keywords:

Personal Care Products

Environmental Chemistry

Risk Assessment

4. Chemistry and Exposure Assessment

New Perspectives and Developments in Chemical (Bio)Degradation and Persistence Assessment

Christopher Hughes, Amelie Ott, Trent Key, Marc Mills

The fate of chemicals in the environment has important implications for exposure, risk, and legacy contamination. An important process affecting fate is degradation which may occur through various processes, both biological and abiotic; to varying extents (primary transformation through to complete mineralization); and throughout the environment under a multitude of conditions. The tendency for chemicals to remain in the environment and resist these degradation processes is sometimes captured with a few different terms, such as persistence, recalcitrance, and non-biodegradability.

Chemical degradation and environmental persistence are becoming increasingly important from a public perception and policy perspective. For example, the widespread presence in the environment of persistent per- and poly-fluoroalkyl substances (PFAS) and microplastic particles have been drivers for rapid acceleration in research and regulation. These issues have raised the profile and interest in chemical degradation as a fate process and property of concern.

Challenges exist in understanding and determining chemical degradation processes caused by a multitude of environmental and experimental factors and competing processes, and due to substances with unique properties and/or complex composition. Many aspects remain poorly understood, such as the influence and dynamics of microbial communities, and the factors controlling degradation rates, pathways and transformation products of chemicals under different test setups and environmental conditions.

This session, sponsored by SETAC's new Persistence Science Interest Group (PSIG), is seeking submissions on all topics related to chemical degradation and environmental persistence. In particular, research that has science-based solutions relevant for understanding and minimizing risk for human health and environment, supports design of safe and sustainable alternatives, and provides solutions for testing and regulatory challenges are welcome. This may include novel concepts or methods to improve understanding of (bio)degradation and persistence (e.g. non-target analysis, molecular biological tools, bio-prospecting), addresses particular (groups of) substances (e.g. polymers), or provides solutions for sustainable innovation or risk management.

Keywords:

Regulatory Science

Sustainability

Environmental Engineering

4. Chemistry and Exposure Assessment

Point-of-Use Drinking Water Exposome and Potential Human-Health Effects

Kelly Smalling, Paul Bradley

This session focuses on assessments of human exposures to and potential effects of contaminant mixtures in point-of-use drinking water. We invite presentations that further inform the shared human exposure and potential health effect challenges of contaminant mixtures in public, private, and bottled drinking water, with emphases on assessments which employ realistically broad characterizations of drinking-water contaminant mixtures, are conducted at the drinking-water point of consumption, utilize effects-based bioassays and computational toxicology tools to inform human effects, employ machine-learning or other approaches to inform exposures in unmonitored locations across the US, and address historically under-served communities and systematically under-informed private-well dependent consumers in rural areas.

Keywords:

Human Health

Water Quality

Environmental Exposure

4. Chemistry and Exposure Assessment

Quantitative Non-Targeted Analysis (qNTA): Bridging the Gap Between Characterization and Quantitation

James McCord, Jon Sobus, Anneli Kruve

Traditional targeted chemical measurements have failed to meet the demands of an increasingly complex chemical landscape. Non-targeted analysis (NTA) methods are increasingly used to satisfy an overwhelming need for environmental monitoring, exposure assessment, and novel compound characterization for a vast, and growing, list of environmentally relevant chemicals. NTA has promised the ability to analyze hundreds to thousands of compounds in a single analysis of a sample, and has frequently been paired with follow-up targeted analysis in order to satisfy a need for defensible, reproducible quantitative estimates of chemical concentration. Targeted analysis has therefore remained complementary to NTA as the provider of quantitative information and NTA has been viewed as largely qualitative thereby limiting the scope of quantitative information available about the environmental contaminants. Recent advancements in computational methods and beyond have progressed quantitative non-targeted analysis strategies (qNTA) to provide concentration estimates for chemicals detected in NTA experiments. Methods using qNTA approaches can better support risk-based decision making, toxicology, and other downstream analyses that require concentration estimates while still providing the breadth of analytes observed in NTA methods. This session will present various advances and applications in making quantitative usage of NTA data. Presentations may focus on development of new modeling techniques for qNTA (considering parameters such as chemical response, extraction/recovery, and method amenability), advances in study design that enable more accurate and/or reproducible quantitative estimates (considering QA/QC and method validation), and practical applications of qNTA to solve research questions (including combining qNTA results with hazard data to inform chemicals risks). A primary goal of this session is to highlight recent scientific advancements and initiate a much-needed dialogue on innovative approaches for conducting qNTA studies and recommended best practices for reporting qNTA results.

Keywords:

Environmental Monitoring

Modeling

Risk Assessment

4. Chemistry and Exposure Assessment

Spatial and Temporal Analysis of Organic Contaminants in Humans, Wildlife, and the Environment

Amila De Silva, Michaela Cashman, Yina Liu, Theresa Guillette

Targeted and nontargeted analysis of anthropogenic substances has uncovered hundreds of thousands of chemicals in our natural environment. Some are legacy substances, others are of emerging concern, and some have been deemed low ecological and human risk but still comprise the profile of complex chemical mixtures. Spatial and temporal analyses examine the behavior of contaminants beyond their presence in an ecosystem. Temporal analysis is used to quantitatively estimate the rate of change in contaminant concentrations, which integrates changes in emissions, exposure patterns, and other relevant factors that influence the deposition and accumulation of substances, such as shifts in dietary preference, trophic status, regulations, climate change, industry shifts, etc. Temporal trends are invaluable and accomplished using periodic sampling or natural temporal repositories such as layered cores (sediment, ice, marine mammal ear wax!) or tree rings. Spatial analysis is also useful in distinguishing factors influencing contaminants on local scales, such as point source emissions, land use, and population inputs versus long range transport. Spatio-temporal trend analysis of organic contaminants presents challenges in how we apply consideration of confounding factors and statistical methods of normalization and comparison.

This session aims to present the latest science in spatial and temporal trend analysis of organic contaminants. Presentations on sampling, data treatment, uncertainty, and implications are highly relevant. Legacy and emerging organic contaminants are welcome.

Keywords:

Chemical Sampling and Analysis

Climate Change

Environmental Monitoring

4. Chemistry and Exposure Assessment

The Practicalities of Non-Targeted Analysis To Support Decision Making

James McCord, Heather Whitehead, Gabrielle Black

Non-targeted analysis is a powerful emerging technology which has been used to characterize novel emerging contaminants, conduct exposure assessment for a wide range of chemical targets, and link chemical exposures to a variety of outcomes. As NTA is still an emerging technology, there has been hesitation in applying the tools outside of research driven contexts and most existing NTA applications have been driven by research interests. Nevertheless, NTA can provide a more comprehensive assessment of environmental occurrence to inform public health protective strategies based on source attribution, exposure potential, hazard and risk assessment, and environmental management strategies. Attendees in this session will learn about practical examples of non-targeted analysis studies, tools, and techniques to support real-world decision making in regulatory and non-regulatory landscapes. Presentations may focus on case study examples of non-targeted analysis to support decision-making efforts such as risk assessment, site investigations and chemical treatment, toxicity analysis, and regulatory processes. Additionally, presentations may also exhibit tools that enable easy, reproducible, and transparent reporting of non-targeted analysis with respect to quality assurance and control needed for widespread regulatory acceptance. This session is open to researchers of various sectors (e.g. government, academia, and industry) as well as to applications of non-targeted analysis to both legacy and emerging contaminants of concern.

Keywords:

Decision Analysis

Combined Exposure / Mixtures / Multiple Stressors

Environmental Chemistry

4. Chemistry and Exposure Assessment

Understanding Environmental Reactivity: Kinetics, Mechanisms, and Transformation Products

Bharat Chandramouli, Kevin Stroski, Garrett Mckay, Shira Joudan

Transformation processes have important impacts on the transport and fate of contaminants in natural and engineered systems. Investigation of chemical transformation is essential to inform environmental and human health risk assessment, sustainability assessment in green chemistry, and development of remediation technologies. This session will focus on abiotic (e.g. photolysis, oxidation, reduction, hydrolysis) and biological (microbial transformation and metabolism) reactions that transform environmental contaminants into known and novel products. The properties of contaminants can change significantly due to transformation, with important implications for environmental fate and toxicity. For example, some chemical compounds have short environmental half-lives but form persistent transformation products with conserved or increased toxicity. Others are precursors to toxic reactive intermediates. Identification of transformation products enables the evaluation of contaminant mass balance and elucidation of reaction mechanisms. Characterization of products formed during water treatment processes is necessary to determine whether contaminants have been degraded, retained, or transformed. Additionally, identifying biological transformation products is critical to understand toxicokinetics and toxic effects of contaminants in humans and wildlife. In this session, new knowledge related to environmental and biological transformation pathways, contaminant reactivity, reaction kinetics, and transformation product identification will be presented with the goal of understanding the implications of contaminant transformation for human and ecological health. We welcome abstracts characterizing reactions in diverse environments including, but not limited to, surface water, wastewater, air, interfaces, indoor spaces, treatment systems, and within humans and other biota

Keywords:

Environmental Monitoring

Chemical Sampling and Analysis

Environmental Chemistry

4. Chemistry and Exposure Assessment

Understanding the Ecological Effects and Rolling Out Solutions for Tire Road Wear Particles and Related Chemicals

Rachael Lane, Austin Baldwin, Prarthana Shankar, Gabrielle Black

Tire and road wear particles (TRWPs) are generated during normal driving conditions and contain both rubber and roadway materials. These particles travel from the roadways and urban environments into surrounding ecosystems where there are deleterious impacts from both the TRWPs and chemicals that leach from the rubber and roadway micro and nano particles. Recent studies have demonstrated the widespread occurrence and toxicity of TRWPs and their associated chemicals (e.g. 6PPD, 6PPD-quinone, benzothiazoles, phthalate esters, polycyclic aromatic hydrocarbons, etc.) in both aquatic and terrestrial environments. Understanding the ecological impacts of this ubiquitous anthropogenic material necessitates an interdisciplinary approach to address the many knowledge gaps relating to the sources, transport, fate, toxicity, and reduction strategies of TRWPs and their associated chemicals. This session will focus on current studies seeking to fill some of these knowledge gaps. We invite presentations of field and lab-based studies focusing on tire wear particles and TRWPs, including research into the leachate and study of individual chemicals and their transformation products to understand the lethal and sublethal exposure effects, identification of tire-related compounds in the environment, research into 6PPD-alternatives, high resolution mass spectrometry investigation into new transformation products, and mitigation, regulation, and remediation strategies.

Keywords:

Combined Exposure / Mixtures / Multiple Stressors

Environmental Chemistry

4. Chemistry and Exposure Assessment

Unveiling Chemical Similarity in Computational Toxicology: Navigating Supervised and Unsupervised Approaches

Kamel Mansouri, Steven Enoch

The field of toxicology has evolved significantly in recent years, with increasing emphasis on the use of new approach methods (NAMs) to understand chemical toxicity. The in-silico arm of NAMs includes structure-activity relationships, read-across, clustering, and classification. At the core of these computational approaches lies the concept of chemical similarity with the premise being that "similar" chemicals have similar properties or biological activities.

However, the use of these tools is often hindered by a lack of theoretical understanding and frequent misinterpretation of results. While similarity can be defined in various ways, it typically falls into two primary categories: supervised and unsupervised. Misuse often arises from misunderstanding the differences between these two categories. The supervised approach, originating from a labeled dataset, involves a learning process to define endpoint-specific similarity by identifying relevant features associated with a known output, enabling predictions in regression and classification. In contrast, the unsupervised approach starts with an unlabeled dataset, aiming to uncover patterns and relationships using arbitrary feature selection, as seen in clustering and principal component analysis.

The common mistake is to apply the unsupervised approach, for example using a similarity index with a general fingerprint, then utilizing resulting clusters to select analogues for read-across that requires endpoint-specific similarity. This oversimplification disregards subtle differences in functional groups, physicochemical properties, and mechanistic characteristics, which can yield significant disparities in biological activity.

The objective of this session is to dispel misconceptions surrounding chemical similarity within the context of use. Additionally, it aims to shed light on machine learning approaches as tools for correlating structures to activity. This involves identifying influential structural, metabolic, and mechanistic features that delineate similarity for specific outcomes. Speakers will present various supervised and unsupervised approaches in toxicological research and risk assessment, providing best practices tailored to specific objectives and contexts. Through case studies, attendees will gain insights into different methods for defining chemical similarity, with guidance on their appropriate usage, emphasizing when to avoid certain methods and when to integrate them synergistically.

Keywords:

Big Data

Chemical Sampling and Analysis

Endocrine Disruption

5. Environmental Risk Assessment

Agriculture and One Health: Toxicology and Ecological Health Risk Assessment of Metals, Pesticides, and Other Agricultural Inputs

Kayode Jegede, Hamzat Fajana

The intricate relationship between agriculture, environmental health, and human and animal well-being has become increasingly evident in recent times. Agricultural practices including metal deposition from agricultural equipment, pesticide usage, and various inputs, have significant implications not only for crop productivity but also for ecological balance and public health. Knowing fully well the importance of Agriculture to food production and general human and animal well being, it is imperative that experts continue to work to tackle environmental contamination challenges relating to Agriculture.

This session aims to present the latest science in the toxicology and ecological health risks associated with agricultural inputs, and to foster discussions on emerging research, challenges and solutions within the scope of One Health. Presentations on the mechanisms of toxicity, bioaccumulation, and potential risks associated with exposure to metals, pesticides, fertilizers, plastics, veterinary pharmaceuticals. Also ecological health risks posed by agricultural inputs on soil, plants, animals. Field studies, modeling techniques and studies that bridge the gap between agriculture, veterinary science, environmental science and public health are welcome.

Keywords:

One Health

Ecological Risk Assessment

5. Environmental Risk Assessment

All Things Related to Endangered Species Assessment

Twyla Blickley, Joshua Arnie

Endangered Species (ES) assessment for pesticides has been dynamic and rapidly evolving since January 2022 when US EPA announced its policy to evaluate the potential effects of active ingredients on federally threatened or endangered (i.e., listed) species and their designated critical habitats before registering new pesticidal active ingredients and products. For example, there have been advances in the selection of non-standard surrogate species for laboratory toxicity testing, refinements in species risk assessment at different taxonomic levels, analysis of spatial data at different levels of resolution, improvements to the base spatial data layers used to conduct overlap analyses, as well as the development of new tools integrating these data. Furthermore, the options for mitigation and conservation where USEPA predicts and/or the Services concludes Jeopardy and Adverse Modification are also expanding.

This session is designed to include a broad assortment of presentation topics associated with ES assessment and pesticides. Perspectives from other chemistries (e.g., pharmaceuticals, petroleum hydrocarbons, consumer products, etc.) are also welcome as we look to further the science and policy of protecting listed species while ensuring production agriculture and land managers have access to a diverse toolbox of end-use products.

This session is submitted by the Plants Interest Group (IG); as such, submissions highlighting concerns on the assessment of herbicides and the protection of listed plants and species that utilize them are encouraged.

This session is also submitted by the Endangered Species and Cultivate Landscapes IG. We agree plants are cool, though all species are welcome.

Keywords:

Pesticides /Plant Protection Products

Ecological Risk Assessment

Plants

5. Environmental Risk Assessment

Analysis of PFAS in Consumer Products and Assessment of Their Degradation on the Environment

Michael Deible, Logan Miller, Lisa Navarro, Robert DeMott

Many types of Per-and poly-fluoroalkyl substances (PFAS) have been used in consumer products for decades. Cosmetics, clothing, upholstery, food contact materials, and many other products have used one of the thousands of types of PFAS to achieve desired properties. Many of these products have already experienced their full life cycle, from manufacture to consumer use to disposal. Analytical methods to determine the amount of PFAS containing material in many consumer goods are in their infancy, while the environmental impact of the degradation of these materials is still unknown. Government agencies are at the beginning steps of regulating these compounds use and disposal. Recently, the United States Environmental Protection Agency (EPA) finalized reporting and recordkeeping requirements for PFAS under the Toxic Substances Control Act that requires manufactures that have made or used any PFAS or PFAS containing articles since January 1, 2011, to report usage, production volumes, and disposals to the EPA. Therefore, this session aims to present the latest science on PFAS used in consumer products. Presentations on product extraction and analytical methods, as well as degradation of PFAS used in consumer products to environmental contaminants, are highly relevant and encouraged.

Keywords:

PFAS

Personal Care Products

5. Environmental Risk Assessment

Bayesian Networks in Environmental Risk Assessment and Management

Wayne Landis, John Carriger, Jannicke Moe, Mariana Cains

Bayesian networks provide powerful approaches for probabilistic modelling, decision optimization, participatory modeling, and uncertainty and sensitivity analysis. The application of these tools to risk assessment have revolutionized capabilities for generating causal insights in complex science and decision problems as well as supporting all phases of a conventional risk assessment framework from problem formulation to analysis to risk characterization to communication and management. Bayesian network applications have steadily increased over a diverse set of problem types including adverse outcome pathways to estimate toxicity of new chemicals; risk assessments for fisheries, ecological communities, marine systems, and wildlife; ecological and sociological mitigation from climate change; and remediation evaluation. The spatial scales have ranged from cells and organisms to local and regional, such as the Mackenzie watershed in Canada or the Delta in California, to global. As demonstrated by packed sessions at SETAC conferences from 2018-2023 (https://www.setac.org/resource/bayesian-networks-take-center-stage-at-the-setac-north-america-44th-annual-meeting.html), the application of Bayesian networks is becoming increasingly influential. To support this growing interest, we are proposing a session on Bayesian networks for environmental risk assessment and decision-making to expand the field and as a place for productive discussions about best practices, challenges, and innovations. Presentations will include case studies and advances in applied research and will initiate and foster discussion about the future uses of Bayesian networks in environmental assessment and management. An international audience is anticipated and international participation from professionals across different career stages and experience levels is encouraged.

Keywords:

Decision Analysis

Risk Assessment

5. Environmental Risk Assessment

Between The Guidelines: Common Issues, Pitfalls, and Unwritten Considerations in Ecotoxicology Data Packages

Alan Jones, Audrey Bone

Regulatory assessment of chemicals requires significant ecotoxicological and environmental fate data generation for subsequent use in environmental risk assessments. Generation of the data package and assessment is often well-prescribed by relevant regulatory legislation, e.g. FIFRA, and largely consists of OECD/OCSPP guideline study designs. However, challenges in testing, study outcomes, and interpretation of results can lead to significant uncertainties in the outcome of the environmental assessment. In addition, ecotoxicity data generation for regulatory purposes is likely to be impacted by increasing interest in the reduction of animal use for toxicity testing and the incorporation of new approach methods (NAMs) into environmental risk assessments. With this in mind, the need for communication between the regulated community and regulators as to common or recurring technical issues is clear. Data generation, interpretation, and application for risk assessment is a complex process in which industry, consultants and performing laboratories, and regulators all participate. This session aims to provide a forum for a multi-stakeholder open discussion regarding common issues in testing and assessment of chemicals. Submissions from across industry, academia, and government are welcomed.

Keywords:

Ecological Risk Assessment

Risk Assessment

5. Environmental Risk Assessment

Bridging the Gap Between Science Development and Policy, Regulatory, and Technology (PRT) Needs for Complex Substances - Supporting Data-Driven Decision-Making in Heath & Environmental Risk Assessment and Management

Sandrine Deglin, Craig Davis, Michael Beking, Scott Coffin

Systematic development and synthesis of information to support risk-based chemical management is complex and multi-faceted. The generation of health & environmental datasets for a single chemical substance can cost millions of dollars over the course of 3-5 years, with complexity, cost, and timelines extending considerably for difficult to test chemicals, mixtures, and complex substances (e.g., UVCBs).

The compositional complexity and diverse properties of these substances and their constituents present unique difficulties for the assessment of their fate, exposure, hazard, and potential risks to human health and the environment, making them a challenge for regulators and registrants alike. Despite a number of workshops, task forces and publications dedicated to understanding the best methods for assessing UVCBs, there is still a need for operational tools, guidance and possibly even harmonized approaches on how to optimally characterize and assess these substances.

As advances in technology, data accessibility, and stakeholder needs push the scientific community towards more rapid decision-making, it is critical to maintain and reinforce the principles of transparency, consistency, and rigor of hypothesis-based, data driven processes for assessing health & environmental risks of complex substances.

This session's goal is to provide a platform for sharing innovative strategies, collaborative approaches, and case studies aimed at tackling complex environmental challenges. We would welcome submissions that address one or more of the following topics: • Balancing scientific (un)certainty & information gaps with the need to provide interim technology, regulatory, and/or policy solution(s)

• Science translation & communication as an effective tool for enhancing stakeholder engagement and collaboration for complex issues

• Retrospectives / Case studies which clearly illustrate an approach, tool, or strategy which was instrumental in advancing the implementation of regulatory, policy, or technology goals

This session will build upon previous efforts to develop consistent, robust strategies for complex substances. Presentations which focus on data synthesis and consensus-building are strongly encouraged. Non-animal testing approaches, e.g., QSARs and grouping/category approaches are also of great interest, as these offer a pragmatic approach for addressing variability and uncertainty in complex substances. Particular consideration will be given to topics which are global, multi-disciplinary, and/or emergent. Examples of these topics include but are not limited to: emerging contaminants, difficult to test substance(s), complex mixtures & UVCBs, or the evaluation of consumer products and formulation.

Keywords:

Combined Exposure / Mixtures / Multiple Stressors

Risk Assessment

Environmental Chemistry

5. Environmental Risk Assessment

Bridging the Gap from Risk Assessment to Risk Management

Brian Mulhearn, Kevin Kalefern

Academia, government agencies, and industry have long used science and policies to make risk management decisions, and risk assessment has become an integral part of that process. The objective of this session will be to present case studies of implementing risk assessment as part of effective risk management that can be used as examples to follow or for training. Presentations will highlight how risk assessments are used in risk management by regulators and other decision makers. Lessons learned and will be used to illustrate and define challenges and best practices. This session, sponsored by the Human Health Risk Assessment Interest Group, has the potential to bring experts from academia, government, and industry to share how they use risk assessments when setting standards, selecting remedies, prioritizing research, and other risk management decisions related to human and ecological health. Our goal is threefold, 1) to respond to a request from members at the 2023 SETAC North America meeting for training in how risk assessments are used, (2) to provide perspective through experience in practice that will help to make SETAC science more accessible and useful to stakeholders, and 3) facilitate a SETAC Fact Sheet summarizing how risk assessment information is used in risk management.

Keywords:

Risk Assessment

Regulatory Science

One Health

5. Environmental Risk Assessment

Evolving Safety Assessments of Biological-based Crop Protection Products: Progress of the OECD's Expert Group Biopesticides

Lisa Ortego, Shannon Borges

The interest and use of biological materials in crop production is increasing globally at a rapid pace. The sector is estimated to expand at a 15% compound annual growth rate. Part of the interest is that these technologies are viewed as safer alternatives to conventional chemicals. The action of some of these materials is very pest specific: a great advantage for safety. While establishing the safety of these materials is as important as for conventional chemicals, there are important distinctions between them. For example, when working with micro-organisms there is usually a rich literature base which can be relied upon for important information reducing the amount of testing needed. Also, unlike conventional chemicals, micro-organisms have to be evaluated for their pathogenic potential, not only in people, but in ecological receptors as well. Also, as a result of their unique nature, some challenges exist with hazard testing for micro-organisms, and existing chemical-based testing guidelines are not always directly applicable. The Expert Group Biopesticides of the OECD have been working for a number of years to provide expert opinion on the safety assessments of these substances, including best practices for incorporating literature, bioinformatics and other information into risk assessments, addressing hazard testing challenges, and advancing knowledge of biological pesticides to assist in decision making on true data needs. The objective of this session is to present the current activities/research/guidance regarding safety assessments for biological-based crop protection, highlighting the activities and publications of the 2022 Innovating Microbial Pesticide Testing Conference.

Keywords:

Pesticides /Plant Protection Products

Ecological Risk Assessment

Wildlife

5. Environmental Risk Assessment

Examining Causation in Risk Assessment, Site Management and Damage Assessments for Contaminated Sediment Sites

Joy McGrath, Susan Kane Driscoll, Robert Burgess

Several frameworks support the assessment, management, and remediation of contaminated sediments. Ecological risk assessment frameworks are used to evaluate the likelihood that adverse effects may occur or are occurring as a result of exposure to one or more stressors and to inform site management and remedial actions. Natural resource damage assessments (NRDA) utilize the results of risk assessments and potentially other lines of evidence in estimating the nature and extent of resource injuries. All of these frameworks rely on sound science and the consideration of causality, which is defined as the relationship between cause (one or more stressors) and effect (adverse response to the stressor[s]). Ecological risk assessment guidance states that without a sound basis for linking cause and effect, uncertainty in the conclusions is likely to be high. NRDA guidance emphasizes the need for authorized natural resource trustees, including federal agencies, states, and Indian tribes, to demonstrate that an injury (i.e., an adverse change in the resource relative to baseline) was caused by direct or indirect exposure to the stressor (e.g., discharge or contaminant) under consideration.

This session will present case studies of causal analysis for ecological risk assessment, site management, and NRDA, focusing on quantifying potential harm or injury from sediment contamination. For sediments, multiple lines of evidence are used to establish if exposure to contaminants has resulted in injury. Typical metrics include comparison to benchmarks based on concentrations in bulk sediment or porewater, toxicity tests, bioaccumulation, and benthic community condition. Advantages and limitations of various lines of evidence, including sediment benchmarks, as indicators of causality and metrics of injury will be discussed. Case studies and examples will be presented to illustrate the use of various metrics to demonstrate injury, assign causality, and estimate damages. Additional topics may include methods for deriving sediment quality criteria, interpretation of sediment quality data, improved sediment sampling collection/analysis methods, application of passive sampling, sediment contaminant modeling, and site remediation, all of which focus on obtaining a better understanding of causality.

Keywords:

Bioavailability

Ecological Risk Assessment

Sediment

5. Environmental Risk Assessment

From PCBS to PFAS - Transferrable Knowledge of Two Persistent Halogenated Organics

Christopher James, Joel Baker, William Hobbs, Greg Allen

Despite decades of regulation and remedial effort, Polychlorinated Biphenyls (PCBs) continue to impair environmental health in freshwater and estuarine systems throughout the world. There have been huge investments in research to understand their behavior in the environment, their effects on humans and wildlife, and ways to mitigate their impacts when they do occur in the environment. PCBs have triggered large-scale state and federal cleanup efforts. We are now better positioned to understand and manage them than ever before.

More recently, the environmental relevance of PFAS, another widely-used group of halogenated organic compounds, has become apparent. Emerging research is documenting the nearly ubiquitous presence of these compounds, and associated human- and environmental-health impacts. Coupled with ongoing research and monitoring, the regulatory and management (cleanup) systems are rapidly evolving.

Under this session, we would like to explore the lessons learned from our collective experiences in managing PCBs, to improve our ongoing and future management of PFASs. We posit that experiences with PCBs can and should be leveraged so that we can better manage PFASs. There are important similarities, and important differences; both can be informative. And so we invite talks that help us explore these spaces.

Specific topics could include: Sources, Fate/Transport, Toxicity, Environmental Occurrence, and Remedial Technologies

Keywords:

PFAS

Environmental Engineering

5. Environmental Risk Assessment

General: Environmental Risk Assessment

The chairs would like to focus this session on issues that bridge both aquatic and terrestrial environments, and all potential stressors (physical, chemical, biological and biotechnological) with human and ecological endpoints towards the goal of integrated holistic assessment such as "One Health."

This session will be poster only.

Keywords:

General

5. Environmental Risk Assessment

New Approaches and Data To Evaluate Environmental Risks of Sunscreens

Carys Mitchelmore, Iain Davies, Sandy Raimondo, Scott Belanger

Sunscreens are important for human health but contain chemicals, such as the active ingredient UV filters, which may enter the environment during and/or after use. In 2022 a National Academies of Sciences, Engineering and Medicine report called for the U.S. Environmental Protection Agency (EPA) to conduct an environmental risk assessment for all UV filter active ingredients contained in sunscreens marketed in the USA, including any new ones that become available. Determining the environmental risk of UV filters requires monitoring or modeled exposure estimates together with studies investigating the hazard (toxicity) of these chemicals in a variety of standard toxicity test organisms and resident species.

This session aims to bring scientists from government agencies, industry and academia together to present the latest science regarding environmental chemistry, exposure, toxicology and risk assessment of UV filters. Presentations exploring their sources, fate, occurrences and concentrations in water, sediment and biota, and studies directed at sampling and analytical development are highly relevant. Studies will also address the effects of these chemicals in the terrestrial and aquatic environments (freshwater and marine) using standard toxicity test species with additional studies of other sensitive species like corals are highly relevant. The aim of the session is to advance our knowledge of the data available to evaluate the environmental risk that UV filters pose and continue a scientifically grounded discussion on potential impacts and research priorities, while recognizing their human health advantages and consideration of "One Health."

Keywords:

Environmental Exposure

Personal Care Products

Ecological Risk Assessment

5. Environmental Risk Assessment

Probing Linkages at the Land-Water Interface To Quantify Contaminant Fluxes and Insectivore Exposure

Brittany Perrotta, Madeline Hannappel, Gale Beaubien, Matthew Chumchal

Adjacent ecosystems are tightly coupled via ecological subsidies and contaminant fluxes. Linkages across the land-water interface provide an ecologically important framework for understanding the fate and transport of contaminants across food web compartments in the environment. Aquatic insects are a critical link between aquatic and riparian food webs, as larval insects undergo metamorphosis into adult emergent insects. These adult insects provide an important resource subsidy to both aquatic and terrestrial ecosystems, and subsequently an exposure pathway for metamorphically-retained contaminants to enter riparian food webs. Because contaminant levels in environmental media (e.g., water and sediment) can be decoupled from the levels accumulated in organisms and moved between systems, estimating risk to adjacent terrestrial consumers can be difficult. Biosentinels such as riparian spiders, songbirds, and bats, are often utilized to quantify and assess the movement of contaminants from aquatic into adjacent riparian food webs as they specialize in the consumption of adult emergent insects. This session aims to present the latest science in utilizing ecological linkages to assess the movement of contaminants between ecosystems and food webs. Presentations that utilize biosentinels, especially terrestrial riparian consumers like spiders within an ecotoxicological framework are highly relevant. We invite submissions from scientists probing the movement of contaminants across the land-water interface in aquatic ecosystems.

Keywords:

Bioaccumulation

Combined Exposure / Mixtures / Multiple Stressors

Environmental Exposure

5. Environmental Risk Assessment

The Intersection of Human Health and Environmental Risk Assessment: A One-Health Perspective

Theresa Lopez, Frannie Nilsen

Environmental releases of chemicals affect both ecological receptors and humans, and different methodologies are used to assess the risks associated with exposure. By necessity, the assessment processes are different but share the same goal: protection of health. SETAC has a strong history of exploring toxicities, hazards, and both effects and challenges to habitat and survival of ecological receptors. This platform presents a tandem examination of human health risk assessment practices to strengthen assessment of both ecological and human health risks at sites affected by chemical releases. Presentations highlighting human and/or ecological risk assessments in various geographical and exposure settings are welcome; addressing the connection between human and environmental health is encouraged. This session will demonstrate how consideration of both human and ecological receptors is accomplished and how these two sciences can interact for the improvement of both.

Keywords:

One Health

Human Health

5. Environmental Risk Assessment

Treatment and Characterization of Permian Produced Water To Support Re-Use

Aaron Redman, Holly Puglis, Pei Xu, Danny Reible

Energy production in the Permian Basin is critical to support domestic energy demands. These processes also produce substantial volumes of water that require responsible management. Due to water scarcity in the Permian Basin region, there is interest in characterizing and treating produced water (PW) for potential fit-for-purpose re-use. Re-use could include surface water discharge, groundwater recharge, irrigation of non-food crops, or other industrial uses, such as cooling water for power generation and feed for hydrogen production. Untreated PW from the Permian is relatively unique due to the high salt content, which generally requires treatment before re-use, but can also contain trace amounts of hydrocarbons, oil field chemicals, and geogenic constituents (e.g., ammonia, metals, and naturally occurring radioactive materials). Therefore, water managers should consider the treatment and final effluent quality when evaluating re-use options.

This session will provide the historical as well as the current state of science on chemical characterization, treatment, and evaluation of treated produced water quality for application to support re-use. The session will include invited speakers as well as those selected from the general abstract submission process.

Keywords:

Water Quality

Risk Assessment

5. Environmental Risk Assessment

Using Mechanistic Effect Modeling To Support Ecological Risk Assessment in the Context of the Endangered Species Act

Valery Forbes, Maxime Vaugeois, Nathan Pollesch

Ecological Risk Assessments (ERAs) are required for species listed as threatened or endangered in accordance with the Endangered Species Act (ESA). However, significant data gaps make it difficult to conduct ERAs for many federally listed species, and risk estimates based solely on toxicity endpoints of sensitive surrogate species can be insufficient. Developing and applying Mechanistic Effect Models (MEMs) can significantly benefit the ESA process as they integrate relevant species life history, sensitivity, and habitat requirements with realistic exposure profiles. Furthermore, they can coupled with traits-based approaches such that single models can represent multiple listed species sharing common traits.

Although MEMs have been developed for use in ERAs over many years, regulatory agencies worldwide have been slow to adopt them. However, they are increasingly being used thanks to the development of frameworks to guide modelers in transparent and reproducible model development, documentation, and communication over the last two decades. The main advantage of mechanistic effect models is that they can incorporate laboratory data measured at the individual or sub-individual scale and translate them to higher scales, such as population and ecosystem scales - the ecological levels we ultimately want to protect. Their translation power can also be used to estimate risks to species that cannot be tested in laboratories, such as species listed as endangered or threatened under ESA. This ability to deal with limited datasets to produce risk estimates with a comprehensive understanding of variability and stochasticity will also prove essential in light of increasing efforts to reduce animal testing worldwide.

This session aims to present the most recent advances in MEMs, their use for ERA of chemical and other stressors, and their application to estimate risks for species with limited datasets. Presentations focusing on data-rich species are also welcome.

Keywords:

Regulatory Science

Environmental Effect Models

Ecological Risk Assessment

5. Environmental Risk Assessment

When 'Off the Shelf' Isn't Good Enough: An Exploration of Higher Tier Studies in Environmental Risk Assessment

Alan Jones, Alan Samel

In the environmental risk assessment scheme, studies are classified as required (standard or core) or not required (higher tier). The core studies include a wide diversity of organisms including soil microbes, aquatic and terrestrial plants, aquatic and terrestrial invertebrates, and aquatic and terrestrial vertebrate species. However, such a breadth of taxa with few standard species included results in a high level of uncertainty with corresponding high safety or assessment factors in the Tier 1 risk assessment. Often, the suite of core studies identifies a single taxon, or more, which does not pass the tier 1 risk assessment. To address this, additional higher tier testing with modified exposure scenarios or multiple additional species is often conducted. The tests can be conducted in the lab or in the field and can increase the number of organisms tested and/or increase the environmental realism of the exposure regime. The additional testing theoretically lowers the uncertainty in the risk assessment and provides a better idea of hazard impacts to the most sensitive taxa which subsequently allows for better refinement of the risk assessment. As a result, higher tier test methodologies such as the generation of species sensitivity distributions (SSD), field studies, or micro- and mesocosms are essential tools for assessing chemicals.

The objectives of the session will be to: • Discuss advantages and disadvantages of higher tier tests

• View data from aquatic and terrestrial higher tier tests

• View data from higher tier tests where lab and field data can be compared

• Provide examples of risk assessments solely with core test results and subsequent and follow up risk assessments, now with higher tier tests

Keywords:

Ecological Risk Assessment

Regulatory Science

6. Engineering, Remediation and Restoration

Addressing Beneficial Use Impairments at Great Lakes Areas of Concern: Scientific Approaches That Lead to Restoration

Marc Mills, David Walters, Amy Pelka

A key goal of the Great Lakes Restoration Initiative (GLRI) is to restore designated Areas of Concern (AOCs). This session will focus on science-based approaches and research to support that goal. Great Lakes AOCs were designated by the number and extent of 14 Beneficial Use Impairments (BUIs) that span a range of potential impairments, e.g., degradation of benthos to restrictions on fish and wildlife consumption These wide ranging BUIs require varying approaches and methods to properly assess them.

To remove BUIs, scientific evidence must be developed to indicate that beneficial uses have been restored and are consistent with a State's delisting criteria. This session will highlight innovative and effective approaches in building the necessary evidence to remove BUIs and, ultimately, provide the basis to delist AOCs. Since management of AOCs does not use a risk paradigm, new or adapted approaches must be employed to build the scientific framework for assess the current status of the beneficial uses and whether the BUIs can be removed following a management action or restoration. Potential approaches include: comparative techniques to assess benthic community health and innovative measures of contaminant uptake into organisms/food webs; alternatives/ innovative applications of established indices of biotic health or integrity; use of recovery trends from long term monitoring programs, habitat restoration indices; and post-remedy monitoring that overlaps with BUI data needs. Linkages between remediation, restoration, and revitalization (R2R2R) with BUI removal will also be explored. The session is expected to benefit project managers working within AOCs, remediation or restoration experts, research scientists in government and academia developing innovative approaches to characterize recovery, restoration, or remediation, as well as the regulatory community.

Keywords:

Aquatic

Environmental Monitoring

Environmental Engineering

6. Engineering, Remediation and Restoration

General: Engineering, Remediation and Restoration

This session will addresses remediation and restoration of stressor impacted air, water, and soil and sediment, including tools for predicting, monitoring and evaluation; technologies and methods for remediation and restoration; environmental engineering; green remediation; damage assessment; and strategies for management.

This session will be poster only.

Keywords:

General

6. Engineering, Remediation and Restoration

Preparing for an Environmental Emergency Response: Disaster Risk Assessment Lessons Learned From the Field

Alejandra Maldonado, Evelyn Reátegui-Zirena, Norka Paden

During an environmental disaster, affected communities might be at risk of exposure to harmful chemicals or substances. Environmental disasters could include natural disasters such as flooding, earthquakes, hurricanes, and wildfires or man-made disasters such as chemical spills, rail incidents, explosives, nuclear blasts, chemical, biological, radiological, or nuclear (CBRN) threats, or infestation of aquatic biological species (e.g. quagga mussels). Climate change also poses new threats and challenges with increases in the frequency and severity of natural disasters. Federal, state, and local agencies must be prepared to respond and assess human and ecological risk following an event and disaster recovery in a safe and timely manner. The impacts from hazards can be reduced by developing response, recovery, and hazard mitigation plans that include risk communication and stakeholder engagement. This session aims to share lessons learned from case studies that risk assessors and public health officials can apply when they respond to an environmental disaster or event.

Keywords:

Environmental Exposure

Human Health

Risk Assessment

6. Engineering, Remediation and Restoration

Promoting Biodiversity in Natural Resource Damage Assessment and Environmental Mitigation Programs

John Isanhart, Bethany Kunz, Bradley Sample

Natural resource damage assessment (NRDA) and environmental mitigation programs have similar goals of offsetting impacts from human activities. The purpose of NRDA is to restore, replace, or rehabilitate natural resources and their services injured or lost due to releases of oil or other hazardous substances. Mitigation programs, such as for streams, wetlands, and endangered species, are intended to avoid, minimize, rectify, reduce over time, and compensate for impacts. These programs, whether managed by Federal, State, or Tribal governments, can be powerful tools for preserving, enhancing, restoring, or rehabilitating ecosystem structure and function, which influences biodiversity. Despite well intentions, addressing biodiversity within NRDA and mitigation frameworks remains challenging. Deciding if, and to what degree, biodiversity measures and metrics can be included in these types of programs relies on answers to questions, including: the utility of surrogates as representative of a broader suite of species; the utility of biomass-based approaches; and the feasibility of quantifying ecosystem services associated with biodiversity. Addressing these questions, as well as others, will help ensure that scientists and program managers have the best available science for assessing impacts and calculating commensurate restoration and mitigation.

We are proposing a session that seeks representatives from across sectors, including academia, regulatory, industry, and Tribal Nations, to present on topics related to incorporating considerations of biodiversity in NRDA assessment and restoration and mitigation frameworks. We welcome presentations highlighting the underpinning of ecosystem services by biodiversity and success stories from NRDA restoration or mitigation efforts to increase diversity or abundance of plants and animals, composition of genotypes, populations, functional types, communities, or landscape units. We are particularly interested in tools for evaluating contaminant injury to multiple species or evaluating restoration or mitigation outcomes as measured by biodiversity metrics.

Keywords:

Regulatory Science

Ecosystem Service

6. Engineering, Remediation and Restoration

Risk Assessment, Remediation, and Restoration: Applying Interdisciplinary Approaches to Creating Successful Remediation and Restoration Projects

Lisa McIntosh, Margaret Roy, Marc Mills, David Walters

Remediation and restoration of contaminated sites are costly and labor-intensive processes. In some instances, remediation can be a highly destructive activity that, in the short term, alters natural settings. Without adequate restoration planning, these alterations can change ecosystems in unintended and negative ways. Additionally, remediation and restoration activities often come with a high carbon footprint and can be extremely disruptive to human and ecological communities that live in or near a contaminated site. Thus, both the thoughtful use of human and ecological risk assessment in the remedy selection and planning stages of remediation, and the understanding of the complex interactions between contaminants in the environment using multiple methods and metrics are critical in minimizing the environmental and social impacts of remediation projects.

This session seeks to discuss the application of risk assessment in determining the need for and scope of remediation and to discuss the development and use of innovative methods, multi-disciplinary approaches, and case studies that assess and measure the temporal and spatial improvements in both ecological and human health, land use, and function following remediation and or restoration at contaminated sites. Session highlights will include approaches and case-studies that include combinations of innovative chemical measures (e.g., forensic approaches), biological measures (e.g., bioaccumulation evaluation) and physical measures (e.g., acres/miles restored) to develop multiple lines of evidence needed to assess remediation and restoration effectiveness. This session's goal is also to present case studies from different regulatory programs across North America (Federal and State programs), with a focus on remedies that balance cleanup with preservation or enhancement of ecological resources.

This session will be of interest to researchers, site managers, regulators, and stakeholders.

Keywords:

Ecological Risk Assessment

Human Health

Risk Assessment

6. Engineering, Remediation and Restoration

The Trinity River Past, Present, and Future: Management of an Urban Watershed in a Growing City

Louise Stevenson, Bryan Brooks, Marlo Sellin Jeffries, Silvia Zavala

The Trinity River is one of North Texas' most vital resources, holding significant economic, cultural, and ecological value to communities in the region. However, the River was not always recognized for its value: levees were built to protect the city after floods in the early-1900s and the River was ignored, allowing pollution to accumulate and water quality to decline. In the last half-century, multiple stakeholders have actively worked to renew the River's condition and place in the everyday lives of North Texans by establishing over 125 miles of trails, planting 8,000 trees, and creating new parks in and around the river. The River weaves in and out of rural and urban communities and serves as the "centerpiece of the Fort Worth community"; however, the City and its River face new challenges stemming from Fort Worth's status as the fastest growing city in the country. As the City expands, new emphasis is placed on preserving green and blue spaces while also meeting the urgent needs of a growing population. This is reflected in Fort Worth Mayor Parker's "Good Natured Initiative" focusing on maintaining green space in the City, Tarrant Regional Water District's decades of investment in green and blue spaces, the non-profit Streams and Valley's Trinity River Strategic Master Plan "CONFLUENCE", and the Trinity River Authority's Basin Planning for responsible water use and reclamation. However, challenges remain for this highly urbanized, effluent-dominated system, shown through fish consumption bans in some areas of the Trinity due to PCB and dioxin concentrations.

In this session, we will invite members of the Forth Worth community representing the various stakeholders working to manage the Trinity River to give presentations and then serve on a panel discussion. The friction between an expanding built environment and the natural environment is not an issue specific to Forth Worth, and we hope to foster a discussion at this year's SETAC meeting that, while focused on the Trinity River and the city of Forth Worth, can serve as a case study applicable to other communities and watersheds.

Keywords:

Water Quality

Human Health

Sustainability

6. Engineering, Remediation and Restoration

Tools, Methods, and Approaches for Natural Resource Damage Assessment

Sarah Allan, Jeffrey Morris, David Rouse, Nadia Martin

Natural Resource Damage Assessment (NRDA) is a science-based legal process for determining the type and magnitude of injury to public natural resources caused by releases of hazardous substances in order to define appropriate restoration. Federal agencies, state agencies, and Tribal Nations, acting as Natural Resource Trustees on behalf of the public, can seek damages, or compensation, to restore, replace, or rehabilitate natural resources and natural resource services injured due to an oil spill or release. In the United States, NRDA may be carried out under different legal authorities, such as the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, also known as Superfund), Oil Pollution Act (OPA), or others. Criteria for a NRDA claim include: confirmation that oil or a hazardous substance has been released, a pathway exists between the point of release and a natural resource, and a natural resource has been injured.

Damage Assessments may be pursued for hazardous substance releases ranging from large, multi-contaminant Superfund sites and oil spills of national significance to releases that involve smaller volumes, more limited response efforts, or relatively low complexity. Accordingly, the methods and approaches used to quantify injury and scale restoration range from large-scale field and laboratory studies to simplified frameworks for rapidly estimating natural resource damages, such as State compensation schedules. In all of these situations, NRDA has procedural requirements and limitations that necessitate tailored scientific approaches and unique interpretations and applications of scientific information.

This session aims to bring together NRDA practitioners from across sectors, including agencies, Tribal Nations, industry, and academia, to share tools, methods, and approaches for damage assessment and restoration for oil spills and other hazardous substance releases. Presentations can include new methods that are applicable to injury assessment, field and laboratory damage assessment studies, and data analysis techniques, including methods for quantifying resource injuries or service losses and scaling restoration benefits. Presentations on frameworks and approaches for scientifically credible, simplified assessments that are applicable to smaller releases are encouraged. Case studies from ongoing or recently settled NRDAs are also invited.

Keywords:

Combined Exposure / Mixtures / Multiple Stressors

Environmental Exposure

7. Policy, Management and Communication

45th SETAC Anniversary: Using SETAC's Successes as a Bridge to the Future

Barnett Rattner, Lawrence Kapustka, Bruce Vigon, April Reed

Since its founding in 1979, SETAC has served as a forum for environmental professionals to identify, characterize and develop solutions to environmental issues, principally related to chemical use and chemical-related processes. SETAC is committed multi-disciplinary, multi-stakeholder and objective science-based approaches to this mission, with the ultimate vision of Environmental Quality through Science. We will organize and moderate a panel discussion composed of student, early career, mid-career and senior members to address guiding questions and more open-ended thoughts and recommendations for SETAC to retain relevancy into the future.

Samples of potential guiding questions: • Based on your review of "History of SETAC Part 1 SETAC Beginnings", how has SETAC evolved over the past 20 years and what changes do you predict for the future?

• During the course of your career, what are the most significant environmental issues that SETAC helped identify and address? Provide examples for which SETAC played a significant role in their resolution (e.g., water quality criteria and ecological risk assessment).

• In the past, in-person Pellston, workshop and focus topic meetings have worked well for SETAC. Have some of our workshop styles outlived their usefulness?

What communication and meeting vehicles might be best in the future (webinars, podcasts, virtual workshops)?

How does one select the best platform for the issue at hand? What are the characteristics of the best participants and leaders of such activities, and what should be avoided?

• A request for other guiding questions from SETAC members will also be solicited a few weeks in advance of the 45th Annual SETAC-NA meeting.

Keywords:

7. Policy, Management and Communication

Combating Misinformation-Disinformation in Environmental Science: Potential Opportunities and Responsibilities for Scientists

Patrick Guiney, Timothy Canfield, William Goodfellow

The proliferation of erroneous information pertaining to scientific investigations, epidemics, and pandemics has persisted as a significant concern, which has been exacerbated by the advent of the internet, the widespread utilization of social media platforms, and most recently the emerging and growing use of Artificial Intelligence (AI). Nevertheless, it is conceivable to alleviate the influence of these fallacious assertions and contributions through rigorous scientific scrutiny. As a result, scientists possess the capability to help counteract misinformation by providing well-founded, scientifically rigorous information that can effectively counter and discredit these deceptive assertions and contributions. This current session, building on last year's session, endeavors to enhance that preceding effort by proposing a platform that facilitates scientists in acquiring pragmatic methodologies to evaluate misinformation, determine the imperative and modus operandi for its redressal, and proficiently disseminate the resultant corrective information. Speakers are invited to present case studies and examples exemplifying instances of mis- or disinformation and deliberate on the methodologies employed to ascertain the necessity of addressing specific inaccuracies or misleading scientific information. Furthermore, the session seeks insights on how to identify proficient experts within one's scientific network who possess the requisite expertise to effectively confront such inaccurate information. We are interested in gathering information on the resources and methodologies which have demonstrated efficacy in rectifying inaccuracies and establishing a robust scientific foundation to counteract misinformation. Additionally, we seek guidance on optimal approaches for crafting key messages and effectively linking new, accurate scientific information to reasonable frameworks that resonate with the intended audience. It is encouraged (though not mandatory) that each presentation commences their talk with a concise 1-3 minute vignette, offering a realistic example that exemplifies the application of suggested techniques presented in their talk. A planned panel discussion among the presenters and the audience is proposed, which will delve deeper into instances where intentional or unintentional misinformation in science communication arises and explore appropriate individual responses when confronted with such situations.

Keywords:

Science Education

Science Communication

7. Policy, Management and Communication

Community-Based Participatory Research Approaches in Environmental Toxicology and Monitoring

Helen Poynton, Valeria Hernandez Talavera, Alan Kolok, Tate Libunao

Community-based participatory research (CBPR) involves collaborating with community partners throughout the research process, from protocol development to dissemination of results. Many researchers are engaging community members to assist in data collection, and in some circumstances, in the quantitation and evaluation of the collected data. While this can dramatically increase sample size, it can also create issues relative to data quality and value, and uncertainties relative to the rights and responsibilities of the participating community members. Stakeholders presented with participatory monitoring measurements often require assurances that results will be useful for, and used to, inform decisions regarding policies and practices. Well-orchestrated CBPR can support valuable monitoring programs, while creating useful data that is readily accessible to diverse stakeholders.

Beyond monitoring, engaging with community members through CBPR, researchers can identify the most pressing environmental health risks and develop culturally appropriate and effective interventions to minimize them. The CBPR approach ensures that research is responsive to the concerns of the affected community and helps to identify key factors that influence exposure and susceptibility. By acting with humility and recognizing that community members are experts in their communities and environments, insights often emerge that would not otherwise have been identified. In addition, environmental health risks are often disproportionately located in lower income or rural areas, communities of color, and within other underrepresented populations. By collaborating with community partners, researchers can better understand the social, cultural, and environmental factors contributing to environmental injustice and work towards more effective and sustainable solutions.

This session aims to discuss the latest research on the relationship between environmental monitoring, toxicology, adverse health outcomes, and environmental justice using CBPR approaches and principles. We will encourage presentations that explore the quantitative advantages of using CBPR in environmental monitoring, while also exploring methodologies that can be used to maximize data quality and encourage participant interaction or retention. We will use this session to highlight useful applications of CBPR and will encourage a discussion of the challenges and opportunities in conducting CBPR studies.

Keywords:

One Health

Ecological Risk Assessment

Science Communication

7. Policy, Management and Communication

Ensuring Scientific Integrity: Strategies for Assessing Study Reliability and Bias in Ecotoxicology

Stephanie Kennedy, Jennifer Olker

Environmental risk assessments aim to provide evidence-based support by accurately predicting risks to various receptors. With the goal to use the best available science for assessments, there is a growing shift to incorporate studies from the peer-reviewed literature along with those that follow validated testing guidelines. It is essential that the reliability and inherent scientific quality of studies be considered, particularly where standardized methods do not exist. Furthermore, both US and European agencies have leveraged data from a variety of sources beyond peer-reviewed literature (i.e., reports, dissertations), and call for clearly defined, systematic review methods when aggregating and summarizing evidence in chemical assessments. There are several sources of guidelines for evaluation of reliability of ecotoxicity studies to be used in chemical risk assessment (i.e., EPA, REACH, OECD). Systematic review approaches have been increasingly adopted in assessments of human health risk, as compared to ecological risk assessments. In general, study evaluation methodologies and critical appraisal tools are more established for application to human health versus ecological risk assessments. Awareness across all sectors of the core study characteristics and minimum quality criteria that are included in study reliability and bias evaluations will ensure that new studies can be used in risk assessments and advance scientific understanding in a meaningful way.

This session invites presentations focused on the topics of study reliability and bias, including frameworks, tools, or approaches that highlight data quality considerations that can be applied to ecological risk assessments. We seek presentations that describe best practices for reliability assessments of ecotoxicity studies, as well as evaluation of environmental exposure datasets. We welcome a variety of perspectives from regulators, academia, industry, journal editors, or other stakeholders including those that report study quality considerations for different exposure scenarios (e.g., single chemical, mixtures, microplastics, or in vitro). Moreover, we invite presentations from those that apply systematic review methodologies in environmental toxicology to share perspectives that enhance transparency and reproducibility in environmental risk assessments. The views expressed in this session proposal are solely those of the authors and do not represent the policies of the U.S. EPA.

Keywords:

Science Communication

Ecological Risk Assessment

Risk Assessment

7. Policy, Management and Communication

Environmental Science and Engineering, Science-Policy, and Education and Outreach Contributions by Three SETAC Lone Star Legends: Professors Kenneth L. Dickson, W. Thomas Waller and C Herb Ward

Bryan Brooks, James Lazorchak, G. Allen Burton

We witnessed the passing of three Long Star Legends of the Society of Environmental Toxicology and Chemistry (SETAC) over the past few months. The story of SETAC cannot be written without the founding contributions of Profs Ken Dickson, Tom Waller and Herb Ward. For example, Ken Dickson, a Past SETAC President and Environmental Education Award Winner, cochaired the original Pellston Workshop with John Cairns Jr and Al Maki, which gave rise to the Society, and Herb Ward, who attended the first Pellston Workshop, served as the founding Editor in Chief of Environmental Toxicology and Chemistry. The environmental science, practice and education impacts of these Lone Star Legends are multifaceted and diverse, from providing foundational contributions to the development of ecological risk assessment, whole effluent toxicity, toxicity identification evaluations, real-time biomonitoring, aquatic bioassessment, mesocosms, laboratory to field extrapolation, and the famous Trinity River study, which provided evidence for benefits of dechlorinating effluent discharges, that were ahead of their time, and establishment of environmental education programs, outreach locations and community engagement activities (e.g., https://www.llela.org/, https://efec.unt.edu/) that continue to positively benefit thousands of people each year.

This session aims to examine and learn from the diverse environmental science and engineering, science - policy and education and outreach contributions by Profs. Ken Dickson, Herb Ward and Tom Waller. Invited experts from different backgrounds will provide keynote presentations that will synthesize the importance of their contributions to the development of SETAC, and their long lasting impacts on the scientific, practice and educational enterprises of environmental science.

Keywords:

7. Policy, Management and Communication

Establishment of a Science-Policy Panel To Contribute Further to the Sound Management of Chemicals, Waste, and Pollution Prevention.

Michelle Bloor, Michelle Embry, Adriana Bejarano, Todd Gouin

SETAC established an advisory panel on chemicals management (SETAC CheM Panel), in December 2022, to coordinate SETAC's contributions to the policy dialogue at UNEP and the Open Ended Working Group (OEWG) for the establishment of a science-policy panel to contribute further to the sound management of chemicals and waste and to prevent pollution (SPP CWP). The members of the SETAC CheM Panel are appointed by the SETAC World Council, guided by the SETAC principles and ensuring sectoral balance, interdisciplinarity, and focus on science-based objectivity.

In 2023 at the SETAC Europe Annual Meeting, SETAC's CheM Panel held its first introductory Special Session on the development of the new UNEP SPP CWP that will be established by 2024-25. The Special Session was an opportunity to engage with the European SETAC community to explain the UNEP processes that are in place to establish the science-policy panel, how SETAC is contributing to the process, and how SETAC members could get involved. The Special Session included talks from a range of international speakers, a panel discussion and audience participation, live Mentimeter polls, and the CheM Affinity Group was launched. Following this session, the CheM Panel undertook a global consultation on chemicals management through Special Sessions at the SETAC Australasia, Latin America, Africa, and North America Annual and Biennial Meetings in 2023, and in 2024 the consultation will continue in Europe and Asia Pacific.

It is proposed that the Special Session at the 45th SETAC North America Annual Meeting in Fort Worth, will be an opportunity to engage with the SETAC community on the science-policy developments. The results of the CheM Panel's Global Consultation on Chemicals Management will be presented and discussed with a panel of invited speakers (from academic, government, business, and NGO sectors) and the audience. Furthermore, since it is anticipated that the new UNEP SPP CWP will be established before the North American meeting, the Special Session will explore the opportunities for SETAC scientists and discuss the next steps in the chemicals management arena.

Keywords:

7. Policy, Management and Communication

General: Policy, Management and Communication

We would like to discuss aspects of science application in policy or regulations and management (regulatory science), as well as science communication to stakeholders in diverse audiences.

This session will be poster only.

Keywords:

General

7. Policy, Management and Communication

Indigenous Knowledge and Chemicals Management

Gunilla Ã–berg

As the new chair for the Indigenous Knowledge and Values IG and based on conversations with Indigenous individuals who are either members of the IKV or have an interest in the work SETAC and this IG can/could engage in, I propose an Indigenous-led session on what we can learn from successful experiences of engagement with Indigenous communities by Indigenous and non-Indigenous professionals from academia, government and the private sector. The importance of this topic cannot be understated, not least due to the increasing pressure and interest to "incorporate" Indigenous Knowledge into existing federal governance and management systems. As this is a SETAC NA meeting, and the situation looks different in different parts of the world, this session will focus on North America.

Keywords:

Indigenous Knowledge and Values

Regulatory Science

Science Education

7. Policy, Management and Communication

Metals: Current Affairs and Recent Developments

Erin Smith, Christine Bergeron, Elizabeth Middleton

Metals occur ubiquitously in the environment due to both natural and anthropogenic sources. In the aquatic environment, the toxicity of metals to organisms is often quantified based on the concept of bioavailability, which is dependent on many factors including the chemical speciation of an individual metal, and should be considered alongside the duration, magnitude, and route of exposure. Metal bioavailability is a function of many environmental modifying factors (e.g., pH, dissolved organic carbon, and water hardness), and bioavailability-based models, such as Multiple Linear Regression (MLR) and Biotic Ligand Models (BLMs), have been developed to account for several of these factors when predicting aqueous metal toxicity to aquatic organisms. These models not only provide valuable insights surrounding metal toxicity within the environment, but have also been used by a range of government agencies and stakeholders to assist in the development of protective levels (e.g., Environmental Quality Standards, Ambient Water Quality Criteria, and Environmental Quality Guidelines). Additionally, these models can play a vital role in addressing water quality concerns and may be used as tools to assist in evaluating site cleanup effectiveness. To date, bioavailability models rank among the most influential developments in metals ecotoxicity, although the potential for new developments in defining environmental protection values for metals should not be overlooked.

This session will aim to host presentations that discuss current and emerging practices in the development of protective values for metals. Examples of relevant presentations may include updates on the development, acceptance, and implementation of bioavailability-based criteria or guidelines relating to a given jurisdiction, examination of the effects bioavailability-based criteria or guidelines on site-specific applications, and time and resource savings resulting from the use of these modern modeling approaches. Application of models in risk assessments, total maximum daily load assessments, or other uses at the local level is encouraged. Presentations that identify emerging concerns related to metals or new approaches for assessing toxicity and developing protective values would also be anticipated in this session.

Keywords:

Metals and Metalloids

Bioavailability

7. Policy, Management and Communication

Multistakeholder Collaborations in Environmental Research: Successes and Opportunities

Adriana Bejarano, Scott Lynn, Mark Johnson

Effectively addressing the triple planetary crises (pollution, climate change and biodiversity loss) faced by humanity needs a collaborative approach that involves multiple disciplines and all sectors of society. Participation of multiple stakeholders and disciplines in scientific collaborations are not only important to ensure integrity and provide balance through the integration of different perspectives, but also in optimizing knowledge, funding opportunities and other resources needed to address complex issues. With the 45th anniversary of SETAC at our doorsteps, we have an opportunity to highlight the successful impact that multistakeholder collaborations have had in advancing environmental science and management, addressing environmental challenges and emerging issues, and enabling the application of science in decision making, policy and regulation. The purpose of this session is to share successes emerging from the collective strength of collaborations through open discussions with invited panelists from different sectors, followed by an open discussion with participants.

Keywords:

7. Policy, Management and Communication

Overcoming Risk Communication Challenges: Strategies To Create Real Behavior Change for Better Communication

Rachel Zajac-Fay, Shawn Sager, Madeline Beal, Jacquelyn Clarkson

Everything that we do as scientists relies on communication. We base our careers on communicating through many different avenues: with our peers through conferences such as SETAC Annual Meetings and peer reviewed publications; through transitioning our science into policy through regulatory agencies; and we share our newfound knowledge with the public through outreach activities. Communication is essential in science and is used by all scientists, whether early career or senior, in all environmental sectors. Yet, we, the scientists, sometimes struggle to communicate clearly and efficiently. Many organizations have strategies for communicating risk, however, there are challenges in successfully implementing these strategies. With the current political and social landscapes, there is an increase in misinformation, disinformation, and low public trust, adding yet more obstacles for risk communication.

The objective of this session will be to identify successful risk communication strategies and methods that overcome communication obstacles and result in real behavior change for better science communication. This may include operationalizing communication, translating risk communication science into practice, providing better organizational infrastructure to support risk communication, engaging reluctant gatekeepers/influencers, implementing strategic approaches for emerging contaminants, etc. This session will also have a focus on risk communication of hot topics such as emerging contaminants, climate change, emergency response spills, etc., and provide discussion and strategies even when there are limited scientific results or regulatory guidance, when there is a great deal of uncertainty, or when public perception drives action.

It is envisioned that presenters in this session will provide real life examples from projects that utilized successful tools and strategies to help scientists communicate in a variety of environmental situations. This session, sponsored by the Human Health Risk Assessment Interest Group, has the potential to bring experts from government, industry, and academia to review shared experiences about risk communication for human and ecological health, culminating in information that can be used by not only government agencies, but also environmental scientists, managers, policy makers, communicators, and others in a variety of environmental situations.

Keywords:

Science Communication

Risk Assessment

7. Policy, Management and Communication

So Now What? Human Health and Aquatic Life Benchmarks, Development and Use

Susan Glassmeyer, Deborah Iwanowicz, James Laurenson, George Ruck

The first question after gathering data in a monitoring program should be "so now what?". Are the concentrations at a level that can harm human and/or aquatic life? To help answer this question, a variety of benchmarks have been developed to allow states, tribes, ecologists, public health officials, drinking water managers, and the public to characterize potential public and environmental health risks when contaminants are detected through monitoring. In the United States, these benchmarks include but are not limited to: 1) Human health benchmarks (HHBM), which are non-enforceable drinking water levels that provide information about adverse health effects from drinking water exposure to contaminants that have no drinking water standards or health advisories; 2) Aquatic Life Benchmarks (AQLBM), which may be used in conjunction with environmental chemistry methods for detecting pesticide residues, primarily in soil or water; 3) water quality benchmarks (WQBs) which assist National Pollutant Discharge Elimination System (NPDES) permitting authorities determine whether discharge limits are needed to help mitigate potential adverse effects on aquatic life; and 4) Health Based Screening Levels (HBSLs), which were developed by the U.S. Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Project for contaminants without regulatory thresholds. Internationally, other benchmarks include the Human Health Reference Values (HHRVs) developed by Health Canada that are calculated using an internationally accepted, health protective approach, which considers the toxicity of the pesticide, typical body weight, drinking water intake estimates, and an allocation factor for long-term exposure.

This session solicits presentations that propose how to develop new benchmarks, alternative benchmarks, or use benchmarks in the interpretation of data. The analytes can be chemical or microbiological, and exhibit toxicity to human or aquatic health.

Keywords:

Human Health

Chemical Sampling and Analysis

Regulatory Science

7. Policy, Management and Communication

Two-Eyed Seeing: Bridging, Braiding and Weaving Indigenous Ecological Knowledge with Western Science to Inform Science

Erin Ussery, Kristin Nielsen, Vince Palace

Environmental research and monitoring programs are increasingly adopting a more holistic approach to understanding environmental health through the integration of Indigenous Knowledge (IK) with Western Science (WS). For generations, Indigenous Peoples have passed on Traditional Ecological Knowledge (TEK) of the water, land and its resources, which has been a guiding factor in the protection of traditional lands. The value of TEK is increasingly being recognized by scientists and policy-makers endeavoring to characterize and mitigate the impacts of anthropogenic pollution on traditional lands and adjacent habitats, as well as their ecological and human inhabitants. Programs and studies that successfully bridge, braid and weave TEK with WS view environmental challenges through an ecosystem-wide and/or One Health lens that is aligned with Indigenous values, while simultaneously benefitting from the technology and tools available to researchers (e.g., long term monitoring datasets, omics approaches, biochemical assays, techniques in analytical chemistry). Examples of activities and decision-making processes that have and/or would greatly benefit from the integration of TEK include environmental monitoring programs (e.g., fish, wildlife, abiotic media), development of consumption advice for aquatic and terrestrial subsistence resources, derivation of surface water criteria for the protection of aquatic life and/or ambient air quality standards to protect air quality. This session will showcase studies where "two eyed ways of seeing" have been/are currently being utilized to effectively and collaboratively answer questions about the nature, extent, and effects of environmental contamination from human activities.

Keywords:

Indigenous Knowledge and Values

One Health

Science Education

8. Systems Approaches

Assessing Environmental Impacts Along Mineral Supply Chains

Adam Ryan, Erin Smith

Ongoing debates and discussions related to critical raw materials strongly indicate that demand for minerals will increase in the years to come. A major driver for this increase in demand is the transition to clean(er) energy. To meet this demand, it follows that there will need to be increasing activity along mineral supply chains. This increasing activity will include obtaining minerals from primary extraction, recycling, and reuse of materials. Obviously, energy is required at each of those steps, and at each step there is potential for mineral emissions to the environment. So, how can the potential environmental impacts (e.g., chemical effects on biodiversity, green house gas effects on climate) along these supply chains be assessed? The outcomes of complementary methodologies like Ecological Risk Assessment (ERA), Life Cycle Assessment (LCA), and Ecosystem Services Assessment (ESA) can inform policy makers, business leaders, and society of these potential environmental impacts. But how can components of these, and potentially other methodologies, be used in combination to efficiently provide adequate information across the variable spatial and temporal scales over which environmental impacts could potentially occur?

This session welcomes presentations that creatively consider the frameworks of various environmental assessment approaches as they pertain to mineral supply chains, while seeking to identify crossover synergies/efficiencies (i.e., individual components from each approach that alone convey important information, but when combined convey a much better holistic understanding) that would be most meaningful to stakeholders. To facilitate identification of these efficiencies, it may be useful to consider how an ERA practitioner might approach LCA, or vice versa. Individual presentations ranging from detailed evaluations to high-level philosophizing are encouraged.

Keywords:

Life Cycle Assessment

Metals and Metalloids

8. Systems Approaches

Chemicals As Biodiversity Impact Drivers

Adam Ryan, Emily Garman, Aaron Stoler

Concerns about biodiversity have been accelerating rapidly with growing focus on how to measure and report both positive and negative impacts. The Global Biodiversity Framework identifies the following five major impact drivers of biodiversity loss: land/sea use change, direct exploitation of natural resources, climate change, pollution, and invasive species. Understanding the effects of these drivers at large spatial scales requires consistent metrics and reporting that apply across the myriad ecoregions and environment types that occur at those scales. Unfortunately, such consistency is often lacking, especially for drivers of loss like exposure to chemicals. Additionally, current biodiversity frameworks often lack the detail necessary to consistently and precisely link metrics with scientific underpinnings. Such shortcomings can limit the value and applicability of the frameworks.

In recognition of the need for consistent and scalable tools/approaches for regulators and conservation practitioners, novel and next-generation biodiversity monitoring techniques are being developed and evaluated. These techniques are leading the way to an appropriate set of metrics that are both specific enough to quantify biodiversity changes at local scales yet broad enough to apply across a wide range of habitat types at varying spatial and temporal scales. Given SETAC's focus on chemicals - and recognizing the wide range of expertise represented by the membership - we challenge the SETAC community to share thoughts, ideas, and experiences related to using various tools (e.g., remote sensing, eDNA, and bioacoustics, etc.) for assessing the effects of exposure to chemicals on biodiversity. We particularly welcome insight into research that explores how to quantify the effects of chemical pollution at broad scales (e.g., national, continental, and global). We also welcome studies that explore the interaction of pollution with other drivers of biodiversity loss at similar scales. Considerations of novel approaches for monitoring, measuring, modeling, reporting, and communicating biodiversity impacts within existing biodiversity frameworks or to the broader scientific and regulatory community are encouraged.

Keywords:

Ecological Risk Assessment

Metals and Metalloids

Sustainability

8. Systems Approaches

Practical, Effective, and Informative Monitoring and Risk Assessment Strategies for Macro- and Microplastics

Leah Thornton Hampton, Eden Hataley, Chelsea Rochman, Kelly Somers

Plastic pollution is a global environmental problem. The accumulation of debris and macroplastics diminishes the aesthetic value of many habitats and can present significant hazards to wildlife. Microplastics do not present the same aesthetic issues as macroplastics given their small size (i.e., < 5mm), but they are undeniably ubiquitous and have the potential to cause adverse effects.

While macro- and microplastics may differ in regard to their defined characteristics and potential impacts they may cause, they both face similar types of challenges when it comes to monitoring, particularly on a large scale. For example, methods for quantifying and characterizing both macro- and microplastics are often not harmonized within and across regions and can be laborious, costly, and time intensive, hindering data analysis and interpretation. In addition, hazard data may be scarce or unfit for the purpose of contextualizing monitoring data and is often a limiting factor for assessing risks associated with plastic pollution.

Despite these challenges, concern amongst the public and scientific community has led to the conceptualization and/or initiation of monitoring programs all over the world to better understand the amounts and types of plastic pollution, identify areas of plastic accumulation, track temporal changes in plastic contamination rates, identify the sources and pathways by which plastic debris enter the environment, and characterize exposure for the purpose of estimating risks. Ideally, these data should provide environmental managers and policymakers with the information and tools required to address plastic pollution effectively and efficiently.

This session aims to showcase differing monitoring strategies for both macro- and microplastics. Relevant presentations should be focused on the following: conceptualization of large-scale plastic monitoring frameworks, identification of management questions and monitoring objectives for plastic pollution, selection and standardization of sample collection and analysis methods, development of quality assurance and control criteria, the development of monitoring study designs, communication of monitoring data, applied scientific research to address large-scale monitoring needs, and integration of plastic monitoring into risk assessment and management frameworks. The session will conclude with a panel discussion to identify common research needs to advance macro- and microplastic monitoring programs.

Keywords:

Plastics (Micro- or Nano-)

Environmental Monitoring

Risk Assessment

8. Systems Approaches

Urban Streams: From Contaminants to Restoring Lost Ecosystem Services

Jeff Steevens, Bryan Brooks

Urban streams provide valuable ecosystem services, including mitigating water flow and water pollution, green space refugia and parks, and wildlife corridors, among many others. The combined effects of habitat stressors such as chemical pollution, nutrients, flashy overland flow events, degraded stormwater quality, and engineered changes in structure and morphology have degraded urban streams and ultimately reduced ecosystem services. Wastewater effluents are a source of diverse down the drain chemicals (e.g., pharmaceuticals, personal care products, per- and polyfluoroalkyl substances, surfactants. Other sources of contaminants in urban settings include runoff from roads that contains tire wear particles and the chemical 6PPDQ.

This session aims to present a series of presentations focusing on contaminants of concern for urban streams, remediation of systems within affected watersheds, and restoration of ecosystem services. Region-specific topics will also include effluent-dominated streams and water scarcity problems that are common in Southwest North America. We invite talks that bridge contaminant issues and water management solutions.

Keywords:

Water Quality

Ecosystem Service

Environmental Chemistry

8. Systems Approaches

What Is Regenerative Agriculture and How Can Soil Health Be Improved in Agricultural Landscapes?

Katherine Coady, Xinyu Yang

Agriculture accounts for ~38% of the world's total land area (i.e., 5,000 million ha). While advancements in agricultural practices since the 1960's have led to significant reductions in the amount of agricultural land use per person, additional improvements in this area are still envisioned (Food and Agriculture Organization of the United Nations, 2024). The ambition of regenerative agriculture is to produce more with less while renewing nature in the process. Improving soil health is one of the main tenants of regenerative agriculture. SETAC members with expertise in soil health and related areas such as: remediation, soil chemistry, ecosystem services, ecotoxicology, and ecological risk assessments can be key contributors to advancements in this field.

This session aims to provide background on the tenants and practices of regenerative agriculture while highlighting current challenges, opportunities, and best practices for improving soil health and the agricultural landscape. This session will also aim to highlight the need for collaboration across multiple disciplines to bring about advancements in regenerative agriculture.

This session is sponsored by the Global Soil Interest Group.

Keywords:

Soil

Plants

Pesticides /Plant Protection Products

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