Advances in Soil Ecotoxicological Risk Assessment of Chemical Stressors

Juliska Princz, Patrick Kabouw, Silvia Pieper, Mark Maboeta

May 10, 8:35 - 12:45, Meeting Studio 314 & 316

Soils are a non-renewable resource that provides a habitat for an extremely diverse range of organisms, thereby delivering unique ecosystem services. However, this precious commodity may remain under-protected within regulatory frameworks worldwide, mainly due to our lack of knowledge on the importance of the complex interactions and dependencies that occur within soil. Novel innovations and holistic approaches to the assessment of chemical stressors promote our understanding of their impact on the multiple facets of soil structure and function. This, in turn, is helping to ensure the protection and restoration of soils, and the myriad of life held within. In this session we aim to elucidate the way towards a holistic approach for soil protection. We invite researchers and regulators interested in further untangling the complexity of soil ecosystem processes, species interactions, and their vulnerabilities, in advancing soil protection. Recent scientific progresses in terrestrial ecotoxicological tools and environmental risk assessment procedures for chemical stressors in soils (e.g. [1], [2]) identified critical needs, data and methodology gaps to properly characterize the risk to soil structure and functions (e.g., how do microbial processes fit? What are critical species and components that we should protect?). This session intends to address these gaps and provide a platform to discuss regulatory frameworks. We want to know what are appropriate strategies for effective soil protection, how to perform targeted higher tier testing, and how modelling approaches and field and laboratory tests can be inter-linked. We challenge the scientific community to share and link their scientific innovations to regulatory developments. This might include guidance on the characterization of exposure and effects, the value and design of higher tier testing, statistical power of laboratory and field tests, the development or improvement of ecotoxicological tests that can contribute to the risk assessment process, and most importantly, how to use these innovations to address the protection of biodiversity and soil ecosystem services. Researchers, students and regulators are invited to discuss their work related to the current soil risk assessment schemes - both prospective and retrospective - for different chemical stressors. [1] ECHA (2016): Topical Scientific Workshop: Soil Risk Assessment. Workshop proceedings. ECHA-16-R-09-EN. doi: 10.2823/785130 [2] EFSA PPR Panel (2016): Draft Scientific Opinion addressing the state of the science on risk assessment of plant protection products for in-soil organisms. https://www.efsa.europa.eu/sites/default/files/consultation/160503.pdf

Antibiotics and Antibiotic Resistance in the Environment: Ecological Fate and Effects, Resistance Development and Implications for Human Health

Jason Snape, Joakim Larsson, William Gaze, Kristian Brandt

May 9, 8:35 - 10:15, Meeting Studio 314 & 316

This session will focus on the fate, behaviour and ecotoxicological effects of antibiotics, co-selective agents, antibiotic resistance (AR) development and transfer in the environment and its implications for human health. Specifically, we use the term antibiotic to include pharmaceutical agents with antibacterial properties. The scope of the session also extends to other chemical agents that can co-select for antibiotic resistance (e.g. metals and biocides). Topics will be grouped in the following four areas: 1) The ecological effects of human and veterinary antibiotics including impacts on natural microbial community structure and function, aquatic food chains and other organisms. 2) The role of antibiotic residues in the environment on the selection and persistence of antibiotic resistant microorganisms and/or AR genes. 3) The dissemination and routes of transmission of AR to humans and implications for human health risk assessment. 4) The fate of antibiotics and AR in wastewater treatment and the environment; including monitoring programmes, and removal and risk management strategies. We would anticipate abstracts that address aspects related to the following questions: Do human and veterinary antibiotics at environmentally relevant concentrations cause adverse effects on aquatic and terrestrial organisms or impact/ support ecosystem services provided by microbial communities? Are particular environments and/or mixtures of antibiotics, metals, and pollutants of special concern? Do human and veterinary antibiotics at environmentally relevant concentrations select for resistant microorganisms or mobile genetic elements carrying AR. What are the pathways of transfer of antibiotic resistant microorganisms and/or AR genes to the human population? What are the environmental conditions that promote the transfer of AR? Are there threshold concentrations of antibiotic agents that promote AR transfer? To what extent does the rate of resistance selection, gene acquisition and dissemination of resistant microorganisms increase with increased exposure to antibiotics or mixtures of antibiotics? What is the frequency and rate of transfer of AR genes between environmental and pathogenic bacteria and can an appropriate risk assessment framework be developed? Does waste water treatment enrich for AR and what wastewater treatment strategies and other management options could be used to reduce the resistance load in the environment? When new antimicrobial drugs are brought to market should an environmental assessment be conducted to identify the pre-existing environmental resistance reservoir? Should pharmacovigilance studies to assess the proliferation of resistance in clinically important pathogens be extended to include environmental compartments?

Applying Bioaccumulation Data to Better Inform Human and Ecological Risk Assessment of Chemicals

Jung-Hwan Kwon, Mark Bonnell, Beate Escher

May 9, 14:20 - 16:00, Meeting Studio 313 & 315

Chemical regulations worldwide evaluate the bioaccumulation potential of chemical substances to protect human and ecosystem health. The assessments rely on partitioning properties such as octanol/water partition coefficients (Kows) and experimental bioconcentration factors (BCFs) using aquatic organisms and other bioaccumulation metrics such as the bioaccumulation factor (BAF). Bioaccumulation is a result of complex absorption, distribution, metabolism, and excretion (ADME) processes and bioaccumulation potential of chemical substances depends not only chemical properties but also physiology of organisms and their ecological positions. Standardized laboratory tests for BCFs mostly using aquatic organisms provide limited information about bioaccumulation potential of chemicals, at substantial financial and animal expense. One role of SETAC is to discuss scientific advances to inform the scientific and regulatory communities. This session will help to foster communication between the regulatory and research communities on the role of bioaccumulation in human and ecological risk assessment of chemicals, including the "domain of applicability" for bioaccumulation information. This includes application of bioaccumulation criteria as well as the role of bioaccumulation in a risk assessment context (e.g., the role of bioaccumulation in human and ecological exposure assessment). Specific topics in this session include but are not limited to: the recent advances in the understanding of bioaccumulation processes, field monitoring and modelling studies, trophic transfer both in aquatic and terrestrial ecosystems, human exposure to bioaccumulative substances, integrated testing strategies, proposals to refine current regulatory bioaccumulation assessment, and case studies of how bioaccumulation data can be used beyond bioaccumulation assessment.

Bioremediation and phytoremediation of contaminated environments

Anna Barra Caracciolo, Michel Chalot, Elisabeth Maria Gross, Jose-Julio Ortega-Calvo

May 9, 11:05 - 12:45, Meeting Studio 313 & 315

This session proposal aims to present scientific contributions that highlight topics within the field of bioremediation and phytoremediation in contaminated soil, water and sediment. Among remediation strategies, the use of biological systems represents an effective, cost-competitive and environmentally friendly alternative to the thermal and physico-chemical technologies more traditionally used. Bioremediation is a powerful tool for recovering ecosystems contaminated by pesticides, improperly handled chemicals, industry by-products, toxic wastes and other organic pollutants. Microorganisms are the main responsibles of chemical degradation and bioremediation strategies enhance the normal biodegradation processing that occur in nature, by introducing (bioaugmentation) or increasing (biostimulation) the growth of microorganisms that can naturally transform and degrade contaminants. In many cases, microorganisms can be supported in their degradation by specific plant contaminant-tolerant (plant-assisted bioremediation). Plant-based clean up technologies (phytotechnologies) are gaining popularity as a sustainable technology for the remediation of contaminants. Phytotechnologies can provide removal of pollutants, including inorganic ones such as trace metal elements (heavy metals or metalloids) together with additional benefits such as soil quality improvement, soil carbon sequestration and biomass for biofuels or biomaterials. Due to the difficulty to remediate sites characterized by multiple pollutants (e.g. organic and inorganic toxic compounds), the study of plant-microbial interactions became a new interesting challenge to discover more sustainability soil recovery strategies. In recent years, new DNA-based technologies have emerged for the characterization of microbial communities that may accelerate the isolation and production of microbes of interest. Further, several microbial and plant species have been tested for the remediation of soil contaminants. However, the parameters involved in the contaminant removal and transformation, as well as those involved in the structure and composition of microbial communities need to be better clarified. Both field- and laboratory based research on bio- and phyto-remediation strategies is welcome.

Challenges and best practice in monitoring of micro- and nano-plastic abundance and environmental distribution

Annemette Palmqvist, Catherine Mouneyrac, Kristian Syberg

May 10, 8:35 - 12:45, Gold Hall

While problems related to ocean plastic litter pollution have been recognized since the early 1970's, microplastic (MP) pollution of marine areas has been subject to renewed focus in recent years. A number of more recent publications have pinpointed that also freshwater systems may be at risk from MPs, mainly due to release of particles and fibers from waste-water treatment plants (WWTP). Although certain types of MPs thus may originate from point sources such as WWTP, plastic tend to travel large distances in the aquatic environment and many sources of plastic pollution is inherently more diffuse. This makes plastic pollution a transboundary pollution problem that cannot be managed alone by individual sovereign states, but requires international collaborative management efforts. However, regardless of the management frameworks, successful management of the plastic litter problem eventually comes down to the quality of input information originating from ecological risk assessments, i.e., based on estimates of exposure and studies of potential effects. The number of monitoring studies on MP abundance and distribution in especially surface waters is increasing. However, due to practical constraints many of these operate with a lower particle size range of ca. 0.3 mm, and since the number of particles tends to increase with decreasing size, as may possible effects on lower trophic level organisms, this range may not adequately represent the main risk from MPs. Thus, there is a current need in particular, for methods and procedures to pick up and identify particles in the lower range of micro-sizes, not to speak of nano-sized particles. However, also sampling procedures for larger particles need optimization and standardization. In addition, for open oceans, MPs are sampled primarily in the top few meters, whereas a major fraction of the MPs is expected to sink to deeper waters and eventually to the seafloor. Thus sampling methods may in themselves bias sampling towards particular particle sizes, shapes or types of polymers. Analysis of complex matrices, such as sediments, soils and sludge, also pose a challenge that generally increases with decreasing particle size, and optimization is needed as well as standardization for better comparisons among different studies. The aim of this session is to: 1) highlight challenges in monitoring and predicting MP abundance & distribution, 2) share and evaluate (new) methods for addressing observed challenges. We welcome contributions presenting studies focused on method optimization, contributions presenting a critical view on methods employed in particular studies, as well as contributions suggesting possible solutions to overcome identified obstacles.

Challenges in Assessment and Management of Cosmetics and Personal Care Products

Iain Andrew Davies, Ursula Klaschka, Erwan Saouter, Jacques Lharidon

May 9, 8:30 - 18:30, Exhibition Hall (Poster & Poster Corner session)

Cosmetics and personal care products (CPCP) are applied to skin and hairs for cleaning, protecting, and enhancing personal beauty. After rinsing, many of these products flow down the drain to mix with wastewaters. In most industrialized countries the drains lead to sewage treatment plants, but in developing countries, where there are few or no treatment plants, the drains flow directly into the rivers or sea shore. This is a typical scenario for rinse-off products such as shampoos, soaps and shower gels. But it is also true for leave-on products such as hair-care products and body lotions, which can be removed from the body by cleaning and bathing. Certain products such as sun protection products may also be released directly while bathing. As a consequence, many cosmetic products reach surface waters in a continuous manner, and could potentially affect human health via the environment. In addition, materials with high partition coefficient values sorb to biosolids which can then be applied to land fertilizers. Cosmetics and personal care products subsequently face significant challenges when assessing their potential environmental and health impacts: • Broad diversity of chemical families and complexity from single ingredients to complex mixtures. o Specific ingredients such as nano-materials, particulates, insoluble polymers, ionisable organics, permanently charged chemicals, and super-hydrophobic substances have physicochemical properties that are currently outside the applicability domain of standard test methods, making assessing their ecological risks uniquely challenging. o Heterogeneous complex mixtures such as NCS (natural complex substances) are difficult to test with current environmental assessment methods which have been designed for single chemicals and homogeneous mixtures. So there is a real need to improve the knowledge about the types and amounts of the constituents. This would allow risk assessments of single substances considering aggregate exposure from various sources. • Exposure of aquatic life (marine and freshwater) and human exposure via the environment to CPCP ingredients, such as surfactants, preservatives, fragrances, natural ingredients (e.g. phytotoxins), plastic microbeads (present in face cleansers) or UV filters (present in sun care products). • Environmental risk assessment of land-applied cosmetic and personal care ingredients. • Regulatory perspective in Europe on Consumer Products Environmental Footprint labelling, (including cosmetics and personal care products). Several environmental projects are under study at national (e.g. French) and international (e.g. EU) levels. • Principles and management of sustainable use of CPCP to enhance environmental quality, ecosystem integrity and reduce human exposure via the environment. The purpose of this session is to present the latest trends and advances in scientific tools that address some of these challenges to better assess the ecological risks of chemical ingredients used in cosmetics and personal care products and health risks by human exposure via the environment.

Environmental consequences of oil and gas extraction and transport

Graham Whale, Richard Wenning

May 10, 14:20 - 16:00, Meeting Studio 311 & 312

Fifty years ago the potential for large oil spills to occur in the marine environment was realised with the sinking of one of the world's first super tankers, the Torrey Canyon. More recently the 2010 Deepwater Horizon oil spill in the Gulf of Mexico served as a reminder that, despite advances in technology, large oil spills can occur and continue to challenge our abilities to respond quickly and effectively. When such events occur the focus is typically on mitigation. More emphasis, however, is needed on improving oil spill response and preparedness tools that can help stakeholders to better understand the potential environmental risks and identify where resources are best deployed to safeguard the different marine environments where oil exploration and production is planned or underway. It could be argued that oil and gas related activities such as exploration, production and refining have been undertaken for many years and the potential environmental risks reasonably well understood. However, new assessment and model tools are continuously being developed; these new tools and approaches generate new considerations and raise new/additional concerns regarding the potential risks of exploration and development activities in marine environments. Similarly, there are a range of activities on land, including accessing unconventional oil and gas reserves by fracking, oil sands exploitation and enhanced oil recovery techniques, that also present new challenges. The intention of this session is to provide an opportunity to disseminate current and best practices regarding approaches and methods to assess the environmental consequences of oil and gas extraction and transport. This will also provide an opportunity to identify if significant data gaps exist and areas that warrant further research. Given that some oil and gas activities have attracted controversy and raised public concerns there is a clear need to have robust tools and scientifically validated approaches to ensure environmental risks are correctly understood and communicated.

Environmental Fate, Effects, and Risk Assessment of Veterinary Medicines

Silke Hickmann, Caroline Moermond, Jason Weeks

May 9, 11:05 - 12:45, Meeting Studio 314 & 316

Veterinary medicines enter the environment via soil (application to terrestrial animals) or water (application to aquaculture). Currently, the fate and toxicity tests used within the regulatory risk assessment are based on OECD guidelines, which were designed for pesticides or general chemicals. As science progresses, it has become clear that for some veterinary medicines, especially ionisable chemicals, these guidelines may not always fully apply. Standard models used to predict environmental concentrations (PECs) may also need a review. This session will focus on the environmental risk assessment of veterinary medicines. It will address all aspects of the ERA, i. e. fate, exposure, and effects. This may include improved modelling for exposure assessment, validation of exposure models applied, but also the question whether pesticide approaches such as Monte Carlo simulation would be applicable to veterinary medicines. Other topics to be included are assessment of degradation and the associated challenges such as extraction techniques and kinetic modelling, potential approaches for higher tier testing of the effects of veterinary medicines, or testing of novel species such as mussels (Bivalvia) for the assessment of bioconcentration. In addition to the ERA of veterinary products for terrestrial animals, presentations on the ERA of aquaculture medicines are highly welcomed. Presentations are also invited that cover less commonly addressed topics such as the exposure of the environment to veterinary medicines used in non-food animals, e. g. from companion animals, and the question if they are of any relevance for the environment. The session will also focus on the regulatory perspective and the status of the risk assessment and guideline development in different regions of the world. Specific regional approaches to e.g. exposure assessment and the determination of specific default values will be addressed. The session also invites presentations on potential risk mitigation measures or risk management plans such as post-authorization monitoring approaches. Approaches to better transform the information from the risk assessments to trans-disciplinary decisions such as benefit-risk assessments in authorization procedures or cost-benefit analysis of mitigation measures are also highly welcome. This may also include potential impacts of veterinary medicines on ecosystem services.

Environmental risk assessment in time and space - To boldly go where no man has gone before

Thomas Preuss, Maria Arena, Ivo Roessink, Theo C.M. Brock

May 10, 14:20 - 16:00, Hall 400

Natural ecosystems are characterised by a high spatial and temporal variability and in recent years environmental risk assessment has begun to address this variability more and more realistically. At landscape scales, ecological as well as chemical processes may exhibit different dynamics as compared to standardized and one-dimensional test settings; hence the persistence and occurrence of ecological effects of toxicants extrapolated from such tests in space and time can only be assessed on appropriate spatial and temporal scales. Although at a local scale, often only one stressor is dominating, populations and communities in a landscape are subject to multiple stressors Nevertheless, the scientific and regulatory interpretation of such risk assessment in time and space becomes a complex exercise. Currently, at lower tiers, environmental risk assessment is a static approach based on worst-case assumptions for which results from standard toxicity tests are compared to the maximal expected exposure. However exposure, effect manifestation and recovery are dynamic processes which depend also on the local situation. In a more realistic approach, like in higher tier studies (e.g. semi-field or field studies), the representativeness at EU level of a specific environmental scenario in a study is a point of concern, since the linking of the exposure within such a study to the various different realistic exposure situations in the field can be a complex task. Presentations in this session may comprise, but do not have to be limited to, results about ecotoxicological effects and/or chemical exposure patterns obtained by the means of model simulations or measurements on mesocosms, field or monitoring campaigns. This session is inviting especially presentations of case studies which demonstrate how to link risk assessment output (lower or higher tiers, laboratory or field studies) to a realistic risk assessment taking into account the heterogeneity in time and/or space, e.g. how to construct risk maps to define vulnerable scenarios based on field studies or how to link exposure over time to effects on individual and population level in realistic landscapes. Also aspects of spatial ecology that influence ecotoxicological effects in the environment are highly welcomed. ...Engage!

Future challenges in sediment toxicity testing for environmental risk assessment

Daniel Faber, Theo Brock, Henry Krueger, Paul Sibley

May 8, 8:30 - 18:30, Exhibition Hall (Poster & Poster Corner session)

Sediment toxicity testing is gaining an increasing awareness within the scientific community. In 2015, a scientific opinion on environmental risk assessment for sediment organisms was published by the European Food Safety Authority (EFSA). This scientific opinion is of high interest for risk assessors and aquatic ecotoxicologists because so far, only the Tier 1 risk assessment for sediment organisms was addressed in the existing aquatic guidance document published in 2013 by EFSA. In addition the European CHemicals Agency (ECHA) updated the sediment part of the "Guidance on Information Requirements & Chemical Safety Assessment" in February 2016. The number of currently available standardized and validated OECD guidelines is limited.These tests mainly cover invertebrates (e.g. Chironomus riparius, Lumbriculus variegatus). One adopted guideline on a sediment test with the macrophyte Myriophylum is available. In North America, sediment toxicity is considered differently within the risk assessment as reflected by the ASTM and US EPA guidelines. In addition, a higher number of standardised test methods are available (e.g. Hyalella azteca, Chironomus dilutus, Leptocheirus plumulosus). There are a number of important differences between the OECD and US EPA guidelines, including the use of natural or artificial sediment, equilibration time, and flow-through or static test design. These test method differences lead to changes in the physico-chemistry of the sediment, in the bioavailability of the test compound, and the concentrations of the test substance in the overlying water, pore water, and bulk sediment. Due to these differences, the test results of studies performed according to OECD and US EPA test methods are difficult to compare. In recent years, it has been discussed which matrix (pore water, water, sediment, bulk sediment, total loading) should be used to determine effects endpoints. Most test organisms are epi-benthic and live on the sediment surface and not within the sediment. A clear correlation between pore water concentrations and observed effects does not exist. Therefore, being aware of discrepancies between OECD and North American methods on the one hand and between EFSA and ECHA guidances on the other hand, some common issues need to be considered, including the relevant route of exposure, as well as how to express test results to be used in the risk assessment. Within the session, we would like to address the differences between the guidelines and the consequences of the different approaches for an ERA using data from both sources and guidance. As the bioavailability in the different test systems is not directly comparable and different main uptake pathways exist for the different taxonomic groups and species, it should be discussed whether approaches as lined out in the scientific opinion are practically feasible.

Hazard and exposure assessment of chemical mixtures: steps towards increasing the realism of human and ecological risk assessments

Rolf Altenburger, Thomas Backhaus

May 11, 8:35 - 10:15, Copper Hall

While approaches for the assessment, management and mitigation of the impacts of local pollution from singular events and point sources are largely agreed upon and widely applied on a routine basis, the assessment of diffuse complex pollution scenarios is still a major challenge for science, environmental policy and chemical management. Meeting this challenge will require a move away from a narrow focus on individual pollutants, coarse acute individual or population level end points, the exclusive consideration of single emission sources and exposure routes towards a broader, more holistic approach. Standard instruments for chemical risk assessment and management, such as Environmental Quality Standards (EQS), Predicted No Effect Concentrations (PNECs) and even Acceptable / Tolerable Daily Intakes (ADI / TDI) need to be modernized and embedded into mixture-aware regulatory frameworks. Also, the current strategy for priority setting is too often focused on identifying individual priority pollutants. There is therefore an urgent need to identify "archetypal" mixtures that result from common emission scenarios, in order to develop more realistic priorities for chemical management. The session aims to provide an overview and critical reflection of the current debate, to identify gaps and bottlenecks. On the one hand, the session aims to present and analyze the specific situations in the different regulatory arenas (e.g. REACH, the Biocide and Pesticide Regulations or the Water Framework Directive), using conceptual analyses or evaluations of specific case studies. On the other hand, cross-cutting, conceptual analyses are also highly welcome, especially if they link between human and environmentally oriented assessments. We invite presentations that analyze the issue from the perspective of all the different stakeholders (academia, industry, regulators, NGOs). The session has be successfully run at previous SETAC meetings, always attracting a sizable crowd, indicating that the topic is of particular relevance for the SETAC community - which is hardly surprising, given the fact that even preliminary monitoring data over and over confirm that organisms are typically exposed to a complex mixture of various toxicants from various sources.

Hazard and risk assessment of human pharmaceuticals in the environment

Reinhard Laenge, Anja Coors, Alistair Boxall

May 8, 14:20 - 16:00, Meeting Studio 314 & 316

Low levels of many active human pharmaceutical ingredients (APIs) are detected in the aquatic environment. The dominant pathway for these residues is the administration to patients and excretion of their residues or the breakdown products entering sewage treatment systems and, after incomplete elimination, the surface waters. Environmental risks of new medicinal products are currently assessed based on a regulatory guideline on a standardized assessment scheme (EMEA, 2006) , in order to fulfill the requirements for market approval. The present testing scheme, however, is not designed to take into account specific properties of pharmaceutical substances in environmental organisms and is typically conducted when a medicinal product is close to an application for market approval. Scientifically based information on potential environmental properties, however, may be required during the early development process of an API, in order to be prepared for specific environmental concerns and consequently, to design substance specific environmental testing strategies. Very little information yet is available on a systematic approach to investigate the responses of environmental organisms to substances with specific properties such as physico-chemical behavior, pharmacological mode-of-actions and (mammalian) toxicity. Thus, model approaches could support predictions of the potential environmental risks of un-tested APIs during early development or on the market. This could help to focus experimental research on ecotoxicological effects on specifically sensitive organisms, life-stages and specific test designs for critical endpoints (intelligent testing).

Human health: linking environmental exposure and human biomonitoring data for human health risk assessment of chemicals

Katleen De Brouwere, Gudrun Koppen

May 11, 8:35 - 12:45, Hall 300

Monitoring of chemicals in different environmental matrices (air, soil, dust, sediment, several types of water bodies) has a long-standing history as an instrument for environmental risk assessment. Risk assessment of humans exposed to environmental sources of chemicals ('Man via the Environment Exposure') classically relies on modelling of human exposure to environmental sources. Man via the environment exposure models are based on predictions of transfer from the environment to dietary commodities, and on assessment of inhalation, dermal and oral intake or contact rates with environmental sources. Such modelling is a simplification of individual's exposure since models inherently rely on assumptions regarding exposure mechanisms and model parameter values. In addition to such a modelling approach to address 'Man via the Environment Exposure', human biomonitoring offers a promising, innovative tool in the field of risk assessment of humans exposed via the environment. Internal exposure levels of chemicals, obtained by human biomonitoring, are considered a direct and integrated measure of chemical burdens of individuals, resulting from diverse exposure sources and routes. Examples of human biomonitoring of chemicals are parental compounds or their metabolites in for example urine, blood, hair or nail samples of individuals of the general population including vulnerable or highly exposed subgroups. In this session, we hope to foster interaction between the disciplines of environmental monitoring, human biomonitoring, and human exposure modelling, and to identify areas where disciplines can supplement and strengthen each other, resulting in informing effective policy-making to protect the EU population from the impacts of chemical exposure on health. We seek submissions in the following areas: - Validation of human exposure models using coupled environmental and human biomonitoring data - Attribution of environmental exposure sources in human biomonitoring studies - Impact of environmental policy actions supported by human biomonitoring results - Interpretation of human biomonitoring data in risk assessment - Pan- European initiatives in environmental monitoring and human biomonitoring

Improving the environmental assessment of complex composition substances and mixtures for Chemicals Management

Hugo Waeterschoot, Daniel Salvito, Robert Diderich, Romanas Cesnaitis

May 11, 11:05 - 12:45, Copper Hall

Chemical safety assessment (CSA) is a stepwise approach which includes hazard (including PBT) and exposure assessments. The fundamental principles of various steps of CSA's are well established in several regulatory systems across the globe. However, the CSA of substances of complex composition like Multi-Component Substances (MCSs) or substances of Unknown Variable Composition and Biological substances (UVCBs)) present unique assessment challenges. Several international regulatory chemicals assessment schemes (like e.g., REACH in the EU, DSL in Canada, or TSCA in the US), have highlighted the complexities and uncertainties related to the registration, characterization, hazard, exposure, fate and consequently the outcome of the risk assessment of these materials. Moreover, while scientific progress has been made in assessing these common substances, there is a clear societal and regulatory need for the further development of scientific assessment methodologies given the implementation of the traditional steps of CSA are not possible without specific adaptations of existing "classical" methodologies. To ensure that these substances can be handled and used safely, there are many different aspects which need to be considered, in particular: substance identification, assessment methodologies and risk management. The identification of the substance is a first and critical step in each of the regulatory systems. Subsequently, different approaches and methodologies are needed for various chemical management schemes whether voluntary systems or for regulatory approaches like REACH for these complex composition substances (e.g. the assessment of combined exposure and combined toxicity). The purpose of this session is to present and report on recent scientific work and progress made on strategies to assess, for example, the environmental combined toxicity (e.g. for metals and inorganics), Cumulative Environmental Risk Assessment (for Personal Care products and for petroleum substances), strategies for the assessment of Natural Complex Substances (NCS), PBT assessment of complex substances by ECHA, or defining characteristics for organic UVCBs (OECD). Furthermore, there is a need to explore how their risk assessment outcome can subsequently be used for risk management to achieve the international goals of the UN-SAICM (Strategic Approach to International Chemicals management). In this session we aim at attracting industry, academia and regulators presenting recent and new scientific approaches and case studies on different type of complex composition chemicals' safety assessment approaches that can be used in the decision making and for chemicals managements. Keywords: regulatory chemical safety assessment, environmental risk assessment, substances with complex composition, combined effects

Integrated approaches for linking chemical contamination with biological effects

Werner Brack, Klara Hilscherova, Henner Hollert

May 10, 11:05 - 12:45, Meeting Studio 313 & 315

There is increasing awareness that chemicals in the environment are typically occurring as complex mixtures, which can be hardly addressed by analytical target monitoring alone. Effect-based tools from community-effect assessment via biomarker-based approaches towards laboratory bioassays addressing apical as well as mechanism-specific endpoints are increasingly used to monitor environmental contamination. At the same time analytical multi- and non-target screening opens new opportunities towards a more holistic approach of addressing large numbers of chemicals and providing a more realistic picture of chemical contamination in different matrices. The present session invites contributions demonstrating integrated approaches to better understand the links between chemical contamination with biological effects. This includes particularly toxicity and analytical profiling of environmental samples, effect directed analysis (EDA) and Toxicity Identification and Evaluation (TIE) as well as multivariate statistical approaches to link effects with contamination patterns. Predictive tools that support toxicant identification in the environment and the establishment of cause-effect relationships (QSARs, structure-elucidation tools, prediction of transformation products, mixture effect models) shall be also presented. We hope to bring together studies and approaches on all kinds of matrices (air, water, sediments, soils, biota, passive samplers) from terrestrial, freshwater and marine systems. Examples and suggestions to involve such approaches into solutions-oriented monitoring and assessment (according to WFD and other regulations) are welcome.

Interpreting Biological Effects of Metals and Their Mixtures in the Aquatic and Terrestrial Environment

Eric Van Genderen, Jose Paulo Sousa, Nicolas Bury, Jean Mathieu Renaud

May 9, 8:35 - 12:45, Copper Hall

A mechanistic understanding of the physiological processes affected by pollutants provides robust scientific evidence that aids regulators in making informed environmental risk assessment. This scientific understanding will be essential to identify and prioritize those populations and environments that require protection in a multi-stressed world. The effects of metals and their mixtures has been well studied over the last 20 to 30 years and this research has contributed to the development of the biotic ligand models that are now incorporated into single metal risk assessments. There are, however, many challenges facing future metal risk assessments that will benefit from a better understanding of the physiological processes underpinning toxicity and their ecological consequences. For example, how to best regulate metals in the context of mixtures (with other metals and in combination with other pollutants), environmental change (changes in ocean pH, rising temperatures and climatic fluctuations), long-term chronic exposure via the water, soil and diet, and adaptation. In addition, the field of metals research has advanced to the point where the principles of bioavailability can be applied to "real world" risk assessment scenarios where metal mixtures commonly occur. This session aims to provide a platform to present our current understanding for interpreting the mechanisms of metal toxicity, and their effects at the population and community level that may aid future metal risk assessment. This session will also provide a platform for the presentation of chemical models adapted to the reality and complexity of soils.

Microplastics, nanoplastics and co-contaminants: Fate, effects and risk assessment for biota, the environment and human health

Matthew Cole, Ana Catarino, Maria Cristina Fossi, Albert Koelmans

May 10, 14:20 - 16:00 / May 11, 8:35 - 12:45, Gold Hall

Plastic pollution is one of today's major environmental issues. The widespread contamination of the environment with plastics of all sizes is receiving growing interest from the scientific community, the public and policy makers. Microplastics (microscopic plastics, <5 mm) and nanoplastics (nanoscopic plastics, <100 nm) can be directly manufactured, or derive from the fragmentation of larger debris. Owing to their hydrophobicity and relatively large surface areas, these plastic particulates can accumulate metals and persistent organic pollutants (POPs) and/or develop microbial biofilms, hosting potentially pathogenic microbes. Microplastics are readily consumed by a wide range of marine biota which can impair the health of the individual with potential adverse outcomes for ecological processes. The risks plastic particulates pose to human health is an emerging topic of concern. Here we focus on better understanding the effects plastic particulates and associated co-contaminants have on biota, from the sub-organismal to community levels of biological organisation, and human health. This session aims to discuss three main questions: (1) What are the mechanisms underlying the effects observed in the laboratory and in the field?; (2) What are the consequences of these mechanisms and observations for environmental exposure, effects and risks, including human health?; and, (3) How can scientific knowledge inform mitigation strategies and policy? We invite high quality contributions that provide either innovative methodologies of general importance, novel mechanistic understanding of effects of plastics, or that show to what extent scientific knowledge from adjacent disciplines can be used for the risk assessment of plastic particulates. We encourage research testing biomarkers of fitness with ecological consequence (i.e. maintenance, growth, survival and reproduction), using concentrations with environmental relevance, or which consider the risk plastics pose to ecological health and processes including ecological modelling. Investigations, and development of pathways and risk assessment, which consider routes by which humans may be exposed, or assess toxicological risk of micro- and nanoplastics to humans are encouraged.

New developments in ecotoxicology for the risk assessment of single and multiple stressors in insect pollinators: from the laboratory to the real world

Agnes Rortais, David Spurgeon, Guy Smagghe

May 9, 8:35 - 10:15, Hall 300

Insect pollinators may be exposed to various stressors (chemical, biological, environmental) which affect their health and, in turn, pollination services which are important components of sustainable agriculture and food security. Given both the various spatio-temporal scales in which pollinators may forage and the multiple possible combinations of stressors and factors that they may encounter, assessing the impacts of combinations of environmental pressures at the population and landscape level is complex and challenging. There are also still important research gaps on stressor effects at all levels of biological organisation for different insect pollinators (from molecular to population) which render the task even more difficult. When assessing risks from pesticides to pollinators, bees are used as surrogate species for insect pollinators and a tiered approach is followed going from the most conservative to the most realistic conditions (i.e. from individuals in laboratory to colonies in (semi)fields). However, while standardised tests for pollinators other than honeybees are missing, field testing for honeybees present important limitations (e.g. too short in duration to detect chronic effects, too small in sampling size to detect significant effects with high statistical power, too small in plot size to reflect the real foraging conditions, lack of methods to study sub-lethal effects, etc.). To improve such tests, alternative approaches and methods such as modelling and simulation studies need to be explored. Indeed, modelling could resolve many of the limitations inherent to the field testing, ie to allow the study of combinations of interactions (eg chemical mixtures, pesticides with biological agents, etc.), the extrapolation from individual to populations, between species, and the testing at various spatial and temporal scales. This session aims to highlight new developments for the risk assessment of single and multiple stressors in insect pollinators. Laboratory studies dealing with the integration of mixture toxicity data and Dynamic Energy Budget models will be included in the light of the new OECD testing guidance on honeybees. Recent modelling developments at the colony level and the landscape level will also be a focus with the description of mechanistic exposure-effect models, population models and landscape models to support the risk assessment of multiple stressors in insect pollinators under different stressors including chemicals, beekeeping practices (for managed bees), climate change, invasive species and pathogens.

Risk assessment and remediation of mine sites and processing sites

Amiel Boullemant, Ronan Courtney

May 10, 14:20 - 16:00, Meeting Studio 314 & 316

There is a long history of mining, mineral processing, and extractive metallurgy in Europe and around the world. This has resulted in numerous instances of metals releases to the environment. Across Europe and North America there are a 10 - 20,000 of closed mines & processing sites. Roughly, half of these sites have a clear identified owner for which post-exploitation regulations applied, the other half - orphans sites - have no current owners and remediation/post exploitation falls under National Regulations Management. Most metal releases result in local impacts on the environment, either land or water. Likewise there are many examples of ecotoxicological studies assessing metal impact as well as both natural and man-assisted ecosystem remediation. Research associated with mine or electrometallurgical sites recovery has been influential in (i) identifying organisms which are both the most sensitive and tolerant to metals, and (ii) understanding compartment distribution of metals in landfill and tailings. Traditionally, contaminants that are frequently associated with mining and electrometallurgical sites in their discharges and leachates include aluminum, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel and zinc. Latest developments in research indicate that Rare Earth Elements get concentrated in landfills and tailings and could pose new challenges. This SETAC session aims at discussing mines & processing sites that have impacted the environment and for which specific risks have been identified. Additionally papers are sought which focus on environmental monitoring and discuss situations where corrective actions have been taken to reduce environmental impacts and ecosystem recovery has been demonstrated. Possible themes include: • Mine tailings, mineral processing, and extractive metallurgy landfills environmental management • Ecological impacts of mining releases on aquatic and/or terrestrial ecosystems • Examples of best practice in landfill, tailings, and industrial platform remediation resulting in risk reduction • Ecological recovery following remedial activities at mine/processing sites • Lab-to-field comparison of effects on organisms associated with mine releases of metals. • New plant-based technologies for recovery and clean-up of metal-contaminated land • Novel monitoring/biomonitoring as a means to assessing metal bioavailability and potential impact at mine/electrometallurgical sites • Post exploitation regulations, their application, concerns and improvement areas

Toxicology and Ecotoxicology, human and ecological risk assessment of engineered nanomaterials: needs, goals and tools/methods for safer-by-design strategies

Gerardo Pulido-Reyes, Simona Scalbi, Sonia Manzo, Georgiana Amariei

May 10, 8:35 - 10:15, Copper Hall

Nanomaterials, nanoproducts and nanotechnologies, included among the Key Enabling Technologies and the green innovations, attracted, in the last 10 years, a lot of public and private resources for the development of new commercial products. However, only when these are near commercialization, discussions about human and environmental safety threaten the investments because industry and regulatory authorities have a different opinion. Besides, there is no consensus inside the scientific community about the toxicity of Engineered NanoMaterials (ENMs: metallic and carbon-based nanomaterials including nanoplastics) to human and the environment. The fact that there are so many ENMs (with different size, shape, coatings, physicochemical properties,...) does not help to clarify this issue. Achieving safer-by-design ENMs requires a deep understanding of their intrinsic properties and the understanding of the behavior and the effects of these materials in the environment and in living systems. Industry needs clear regulations on safety and regulators ask for more data to support the safety assessment. A central point to fill this gap is to identify the common basic needs for the Environment and Human Health Safety (EHS) assessment during the design, production, use and end of life phases of engineered nanomaterials and nanoproducts/nanotechnologies. This can be obtained through the integration of, still separated, safety assessment methods into an unified approach, which needs to be developed and implemented in collaboration with industrial engineers taking into account innovation and competitiveness issues. The stimulation of trans-disciplinary collaboration between different research areas (physics, chemistry and biology) and between scientific research and market needs, to improve EHS assessment, is the aim of this session. In this context, the session focuses on: • New evidences of the key physicochemical parameters which drive the toxicity and eco-toxicity of ENMs to both human health and environment; • Effect of abiotic and biotic transformations of ENMs on their intrinsic toxicological properties and the effect of co-exposure of ENMs with other classes of pollutants; • Routes of exposure and internalization. If accumulation is an issue, the study of food chain transfer is of outmost interest: ecologic assessment using single-food chain as a basic approach and if possible, increasing complexity using mesocosm studies; • Studies which use novel approach for defining the toxicity of ENMs as High Throughput Screening (HTS) and wide screening assays; • Predictive tools based on structure-activity relationship of nanostructures (materials) within biological and ecological matrices to advance cost-effective and environmentally benign processes and engineering solutions over full life cycles; • Case studies on integrated research to construct and test a safe-by-design (SbD) approach; • Study of current nano-consumer exposure scenarios and improvement based on the identified chemical and physical properties throughout Environmental and Human Risk assessment, management and communication; • Life cycle Thinking and Assessment (LCT, LCA) approach, to assess technology and safety issues, to reduce the risk for both environment and the whole society. Platform presentations will endorse in particular the integration or combine use of these assessment methods to evaluate EHS of the nanoproducts/nanotecnologies.

Wastewater effluents: How research can improve risk assessment and regulation

Dean Leverett, Mirco Bundschuh

May 8, 8:35 - 10:15, Meeting Studio 314 & 316

The vast majority of chemicals discharged to the aquatic environment are delivered in the form of effluents - aqueous mixtures of chemicals derived from industrial processes or the treatment of domestic sewage. Municipal wastewater treatment works are designed primarily to treat domestic wastewater and biological treatment processes are therefore employed to facilitate the removal of ammonia, nitrite and nitrate, rather than to deal with the broad range of chemicals present in industrial and domestic wastewater. Additional 'tertiary' or 'advanced' treatments may help to deal with specific substances and reduce potential risks to the receiving environment. Moreover, the regulatory focus has shifted in recent years from industrial chemicals onto those derived from domestic sewage (e.g. pharmaceuticals, personal care products, etc). This session will focus upon the considerable challenges, which underpin the risk assessment, regulation and control of these point-sources of chemical contamination. For this purpose, high quality information is required on the composition of effluents, the characteristics of the receiving environment, the sources of substances in the effluent, the effectiveness of advanced effluent treatments, and the effects of the substances (both alone and as a mixture) on ecosystems. Although this is an issue of global relevance, the systems used to monitor, control and regulate industrial and domestic sewage effluents differ among regions and countries. Some authorities focus on the overall ecotoxicological effects of effluents while others apply regulatory systems dealing with chemicals on a 'substance by substance' basis. In this session we invite presentations which highlight how recent insights can be used to advance, support or challenge the regulatory processes that are applied to control wastewater effluents. This may include: • Reviews of the effectiveness of regulations and procedures used to asses risk and control wastewater effluents, or substances entering wastewater systems, • Chemical monitoring of wastewater effluents and the receiving environments • Sources of substances and potential source controls, • The efficiency of new or existing treatment technologies and/or factors that may affect the viability of such treatments, • The behaviour of substances discharged in effluents and their fate after discharge, • Population-relevant ecotoxicological effects inferred by substances present within wastewater effluents (alone or in combination), • Studies, which help to improve the resolution with which we can measure environmental change (e.g. following the introduction of new controls).