ABSTRACT BOOK

SETAC EUROPE 33RD ANNUAL MEETING

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"DATA-DRIVEN ENVIRONMENTAL DECISION-MAKING"

Abstract Book

SETAC Europe 33rd Annual Meeting

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This book compiles the abstracts from the 33rd annual meeting of the Society of Environmental Toxicology and Chemistry – Europe (SETAC Europe), conducted from 30 April–4 May 2023 in Dublin, Ireland, and online.

The abstracts are reproduced as submitted by the author and accepted by the scientific Committee. They appear in order of abstract code and alphabetical order per presentation type. The poster spotlight abstracts are included in the list of poster abstracts. The presenting author of each abstract is highlighted in bold.

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Society of Environmental Toxicology and Chemistry Europe (SETAC Europe)

About SETAC

In the 1970s, no forum existed for interdisciplinary communication among environmental scientists, biologists, chemists, toxicologists, managers, engineers or others interested in environmental issues. The Society of Environmental Toxicology and Chemistry (SETAC) was founded in North America in 1979 to fill the void and quickly saw dynamic growth in the Society's membership, meeting attendance and publications.

A unique strength of SETAC is its commitment to balance the scientific interests of government, academia and business. The Society by-laws mandate equal representation from these three sectors for officers of the World Council and Geographic Unit Boards of Directors and Councils, and in the composition of committees and other society activities. The proportion of members from each of the three sectors has remained nearly equal over the years.

The Society is concerned about global environmental issues. Its members are committed to Environmental Quality Through Science®, timely and effective communication of research, and interactions among professionals so that enhanced knowledge and increased personal exchanges occur. Therefore, SETAC publishes two globally esteemed scientific journals and convenes annual meetings around the world, showcasing cutting-edge science in poster and platform presentations. Because of its multidisciplinary approach, the scope of the science of SETAC is broader in concept and application than that of many other societies.

SETAC's growth is reflected in the founding of Geographic Units around the world. SETAC Europe was established in 1989 as an independent organisation, followed by SETAC Asia-Pacific in 1997 and SETAC Latin America in 1999. In 2002, the four existing organisations joined together under the governance of the SETAC World Council. SETAC Africa is the most recent Geographic Unit, which was adopted in 2012. As evidence of international acceptance of the SETAC model and of the great interest at the local level, regional chapters and branches have emerged in a number of countries.

SETAC publishes two journals, *Environmental Toxicology and Chemistry* (ET&C) and *Integrated Environmental Assessment and Management* (IEAM). ET&C is dedicated to furthering scientific knowledge and disseminating information on environmental toxicology and chemistry, including the application of these sciences to risk assessment. Integrated Environmental Assessment and Management focuses on the application of science in environmental decision-making, regulation and management, including aspects of policy and law, and the development of scientifically sound approaches to environmental problem solving. Together, these journals provide a forum for professionals in academia, business, government and other segments of society involved in the use, protection and management of the environment for the enhancement of ecological health and human welfare.

SETAC books provide timely in-depth reviews and critical appraisals on scientific subjects relevant to understanding a wide range of contemporary topics pertaining to the environment. These include any aspect of environmental chemistry, toxicology, risk assessment, risk management or environmental policy.

SETAC has two administrative offices, in Pensacola, Florida, USA, established in 1992, and in Brussels, Belgium, established in 1993.

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AuNPs and the enhancement performance is identified in this work. This platform has the potential to be a more sensitive microplastic detection approach and serve as a new tool for rapid monitoring the spatial and temporal distribution, toxicity, and environmental exposure of microplastics.

Track 4: Ecological and Human Health Risk Assessment of Chemicals, Mixtures and Stressors and Risk Mitigation Strategies

4.01 Advances in Environmental Risk Assessment of Chemicals

4.01.T-01 National Risk Trends Based on Pesticide Sale Data in Germany - A Comparison of Five Indicators

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The reduction of environmental and health risks from the use of pesticides in agriculture is a corner stone of the recent European Farm-to-Fork Strategy of the European Commission, calling for a 50% reduction in the amount and risks of pesticides by 2030. EU policies like the Sustainable Use Directive (Directive 128/2009/EC) already demand the implementation of National Action Plans to reduce environmental risks from pesticide use.

To monitor the ubiquitous efforts towards risk reduction, a robust assessment and indicator system is required. Thus, comprehensive and transparent indicators are needed to capture, on national level, the heterogeneity of active ingredients in terms of their potential impact on the environment and human health. The Harmonized Risk Indicator (HRI) was developed as a harmonized approach for all EU Member States to assess the risk trends on national level and EU level to represent the risk caused by pesticide applications. Such an approach requires EU-wide availability of the necessary data as well as an appropriate degree of complexity in the calculation of the indicator. To meet these requirements, the COM has adopted the HRI, which combines the hazard classification under Regulation 1107/2009 with the sales statistics.

To reflect the risk trend of AIs, the assessment must take into account their intrinsic properties and specific toxicity values. Several existing risk indicators follow this approach. Numerical values are assigned according to the various AI properties and toxicity end points and added for several AI properties to produce an AI-specific weighting factor that reflects toxicity to humans and the environment, as well as environmental fate. The Environmental Impact Quotient and Toxic Load Indicator were developed based on such an approach. In Denmark, the Pesticide Load Indicator, has been used to estimate risk at national and regional levels and to calculate pesticide taxes. In Sweden, the Pesticide Risk Indicator was developed to map long-term risk trends at the national level.

To compare the trend development of the different indicators, we calculate all indicators with the German sales data and present the results in the Pesticide-Trend Database Explorer (https://sf.julius-kuehn.de/pesticide-dbx/), a transparent online tool for flexible evaluations of the indicators regarding the base line period, the weighting factors and the different AI groups. Based on these results simple improvement of the HRI are discussed.

4.01.T-02 Validating Predicted No Effect Concentrations (PNECs) in the Field

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Both the derivation of predicted environmental concentrations (PECs) and predicted no effect concentrations (PNECs) used in the environmental risk assessment of chemicals rely on various models and assumptions. Particularly for PNECs, a validation of these models and assumptions in the field is pending and challenging as targeted post-authorisation monitoring is scarce and specific ecolgoical effects are largely masked by other influences. In this exemplary assessment we aim to answer the questions what steps enable a validation of PNECs, whether the PNECs for pesticides we monitored were adequate and of what use such a field-based validation can be. On the basis of a large stream monitoring data set of >100 small streams we linked chemical (75 pesticides in >800 water samples) with biological measurements (invertebrate communities) to validate the PNECs of primarily invertebrate-toxic pesticides in surface waters.

We identified five general steps to be performed to validate PNECs with field data: 1) Measure environmental eposure adequately. 2) Assess a suitable ecological response. 3) Link dose and response. 4) Define a protecion. 5) Integrate unvertainty. Referring to our case study, we were able to link the ecological effects observed reflected by the invertebrate-based and pesticide-specific SPEcies At Risk ($SPEAR_{pesticides}$) indicator to the maximum single pesticide-related factor of PNEC-exceedance measured using a linear correlation ($R^2 = 0.44$, $p < 0.001$). We found that, in the average stream subjected to various chemical and environmental stressors, peak concentrations equalling the PNEC were already associated with a $SPEAR_{pesticides}$ that did not comply with the previously defined protection goal.

Our analysis questions the established principles, data requirements and assessment factors according to which pesticide PNECs for surface waters specifically and PNECs in general are derived. The use of this field-based validation and respective consequences for pesticide regulation are to be discussed.

4.01.T-03 Development of Analytical Frameworks to Assess the Risks Posed to Soil by Emerging Contaminants

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Embryos in the high treatment group hatched earlier and total mortality was significantly higher compared to all other groups. While no significant difference was found in respiration, larvae in the high treatment group were smaller and had higher deformation rates. Transcriptomic profiling and metabolomics analysis revealed a higher expression of stress related genes and a significant increase in oxidized glutathione (GSSG) in embryos and larvae from the high treatment group which is indicative of oxidative stress. Also, changes in metabolites related to energy metabolism and upregulation of genes related to haemoglobin transport and metabolic rate suggests an active detoxification process in larvae from the high treatment group which could help explain the slower growth of larvae.
Our result show that early life stages of Atlantic cod is sensitive to environmentally relevant levels Cu around marine tailing deposition sites.

4.03.P-Tu353 Effects of Short-Term Mine Tailing Exposure on Stage CV *Calanus Finmarchicus*

Linn Hjelmeland Svendheim[1], *Julia Farkas*[2], *Tomasz Maciej Ciesielski*[3], *Bjørn Henrik Hansen*[2], *Torstein Kristensen*[1], *Dag Altin*[4] *and Pal A Olsvik*[1], *(1)Nord University, Norway, (2)SINTEF, Norway, (3)Norwegian University of Science & Technology (NTNU), Norway, (4)Research Infrastructure SeaLab, Norwegian University of Science & Technology (NTNU), Norway*

Mineral demand for new technologies and industries drives an increase in mining activities worldwide. As tailing deposition on land takes up large areas and give rise to numerous environmental challenges, marine tailing disposal has been proposed as an alternative in some areas.
The marine filter feeding copepod *Calanus finmarchicus* is an important food source for commercially important fish species and other marine animals due to its high lipid content. The release of particles and chemicals associated with marine tailing deposition may pose a potential threat to fat-rich zooplankton, as previous study revealed a delay in development and lower lipid accumulation in developing *C. finmarchicus* exposed to mine tailings.
To investigate the potential short-term effect of mine tailing exposure on later life stages, *C. finmarchicus* stage CV was exposed to pure calcium carbonate particles and Cu in high and low concentrations, as well as calcium carbonate and copper tailings in low, medium, and high concentrations, with five replicates per group, for 96 hours (10 °C). In addition, five replicates of control (clean sea water with food) and starved control (clean sea water with no food added) were included. At termination, respiration measurements and biometry images were taken, and samples for metabolomic analysis were collected.
The results showed that the lipid reserve was lower in all treatment groups compared to the control, and significantly lower for the high calcium carbonate particles and tailing treatments and the starved control. Respiration rates in animals from low tailing and high and low Cu exposures were higher than respiration rates in the control group, while medium and high tailing exposures generally caused lower respiration rates. The lowest respiration rates were observed in animals from the starved control group.
The global metabolic profiling results revealed changes across a broad range of pathways, including mechanisms linked to energy metabolism and growth. One of the most striking changes occurred in the glutathione pathway, which is highly consistent with previous work demonstrating the role of reactive oxygen species (ROS) and redox imbalance in starved animals.
Our result suggests that ingestion of tailing particles most likely impair metabolism and induce a response resembling starvation in copepods exposed to mine tailings.

4.04 Bioremediation and Phytoremediation of Aquatic and Terrestrial Contaminated Ecosystems

4.04.T-01 Increasing the Removal of Micropollutants in Municipal Wastewater by Natural Adsorbents Addition in Constructed Wetlands: Road to Circular Economy

Nuria López Vinent[1], *Nicola Montemurro*[1], *Alberto Cruz-Alcalde*[2], *Albert Sales Alba*[1], *Ana Piera Santacruz*[1], *Jordi Llado*[1], *Xavier Borrell-Diaz*[3] *and Sandra Pérez*[1], *(1)Department of Environmental Chemistry, IDAEA-CSIC, Spain, (2)Department of Chemical Engineering and Analytical Chemistry, University of Barcelona, Spain, (3)IDAEA-CSIC, Spain*

The occurrence of micropollutants (MPs) in aquatic ecosystems are mainly attributed to the discharge of wastewater from conventional wastewater treatment plants (WWTPs), which are not specifically designed to eliminate them. Even at low concentrations, many of these compounds can cause hazardous effects on human health and ecosystems. Thus, additional treatments are required at WWTPs to eliminate these MPs. Although some processes have been tested, research on Nature-based Solutions (NbS) is limited investigated.
Among NbS, constructed wetland (CW) is one of the technology recognized for their ecofriendliness, low costs of operation and maintenance and simplicity. However, the requirement of large time of operation, since are natural treatments, could limit the implementation of CW on a full scale. In this sense, this work aimed to investigate the performance of addition of various natural support matrices (two of them wastes of food industry) since they present high adsorption properties, in CW for their capacity to remove 27 selected MPs at 1 µg/L in secondary wastewater effluent. With this purpose, it was intended to reduce the time of operation in CW by the addition of potential adsorbents and framing the project in circular economy.
In this study, four vertical flow CW (VFCW) planted with Sparganium erectum were assembled at semi-pilot scale (15 L water capacity) with recirculation. Each one was filled with a layer of cobbles, volcanic rocks, fine gravel and sand. In three of them, an additional material mixed with sand was added (burnt cork, almond shell and chestnut shell). The last one, without any aditional material was used as control.
The results at 6 days of retention time revealed good performances of VFCW filled with almond and chestnut shell reporting a MP elimination in water higher than 90% for overall compounds (25 of 27). VFCW containing burnt cork and control showed the lowest removals (only 15 and 13 of 27 MPs, respectively, achieved eliminations higher than 90%). The total average abatements were: 88, 87, 77 and 68% for chestnut, almond, burnt cork and control, respectively. Comparing 3 and 6 days of RT the results were very close in systems containing chestnut and almond shell. For instance, in VFCW with chestnut shell the average removal

4.04.P-Th259 Influence of Saponin on Pyrene Microbial Degradation in Different Pollutant Carbon Fluxes Relevant for Soil Bioremediation

Alicia Fernandez-Vazquez *and Jose Julio Ortega-Calvo, Instituto de Recursos Naturales y Agrobiologia, Spain*

The limited biodegradability of slowly desorbing contaminants must be taken into account when developing nature-based solutions (NBS) to soil pollution by polycyclic aromatic hydrocarbons (PAHs). The use of biosurfactants is a well-known strategy for promoting their biodegradation in polluted soils. Although the potential of microbial biosurfactants, such as rhamnolipids, is well known, fitogenic (i.e., plant-produced) surfactants, such as saponin, constitute a realistic alternative, considering sustainability and financial aspects of NBS. This non-ionic biosurfactant, with an excellent performance, low toxicity and wide presence in nature, contains a hydrophilic glycoside backbone and a lipophilic triterpene derivative, contributing to its excellent solubilization capacity for hydrophobic organic contaminants.

The present study seeks to investigate the influence of *Quillaja* saponin biosurfactant on biodegradation of ^{14}C-pyrene by the PAHs degrader *Mycobacterium gilvum VM552* under bioavailability restrictions. The experiments were carried out in three different exposure regimes of pyrene generating dissimilar carbon fluxes: supplied as crystals (high carbon flux), supplied by partitioning from loaded polydimethylsiloxane (PDMS- medium) and sorbed to a soil-soot mixture (low), where pyrene was strongly sorbed to soil and soot particles.

The results showed that saponin above and below its critical micelle concentration (0.5 g/L) promoted the biodegradation of pyrene, in different ways depending on the scenario. Significant solubilization and enhanced biodegradation of crystalline pyrene was observed. The enhancement was, however, not so efficient for pyrene-preloaded PDMS and pyrene sorbed into soil-soot mixture. This loss in the efficiency of biosurfactant promoting biodegradation could be explained by the decline in bioavailability and the adhesion of bacteria cells to PDMS surface and soil particles. Our study suggests that saponin can constitute a valid alternative in risk-minimizing strategies at different stages of the bioremediation processes.

4.04.P-Th260 Soil Enzyme Activity in Polluted Soils Treated with Waste-derived Technosols

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Metal mining causes severe pollution problems by releasing potentially hazardous elements (PHEs) into the soil-plant-water system, affecting its ecosystems functions and human health. This study evaluates the effectiveness of Technosols designed to remediate soils affected by the Aznalcóllar mine spill, one of the largest mining accidents in Europe. In particular, the remediation process is assessed by measuring soil enzyme activity (dehydrogenase, β-glucosidase, cellulase, acid phosphatase). Six Technosols (T1-T6) were made by mixing polluted soil (50-60%) and organic/inorganic wastes from mining (iron sludge, marble sludge, and carbonated waste from peatbogs), urban activity (composted sewage sludge, and vermicompost from gardening) and agro-industry (solid olive-mill by-product). The assay included two controls (polluted soil [PS], unpolluted soil [US]), each Technosol [T1-T6] and six treatments of the PS to which the Technosol (T1-T6) was added on top (R1-R6). After 2 months of controlled incubation, soil enzyme activities, soil properties (pH, EC and OC), and soluble and bioavailable PHEs concentrations were analysed. No changes in the different enzyme activities were found in the treatments (R1-R6). Two months were not enough to recover the low biological activity in the PS treated with the different Technosols on top (R1-R6). However, in Technosols (T1-T6) the biological activity in terms of dehydrogenase activity has been stimulated by far compared to the US. Especially in the Technosols containing solid olive-mill by-product (T1 and T4) or composted sewage sludge (T2 and T5) with more than 100 µg TPF g soil^{-1}, while in the US about 27 µg TPF g soil^{-1}. Likewise, β-glucosidase, cellulase, and acid phosphatase activity have increased in Technosols (T1-T6) with respect to PS control, but not in all cases they exceeded those given in US control. Although no changes in enzyme activity were observed, soil properties in PS treated with Technosols (R1-R6) have generally improved; in particular, pH rose to neutralisation and OC has increased by about 0.5%. Also, the solubility and bioavailability of Cd, Cu and Zn was reduced in R1-R6 soils, although there was an increase in the levels of soluble and bioavailable Sb and bioavailable As (not in soluble). Thus, these Technosols were effective in remediating soils polluted by sulphide mining as they recover soil properties, reduce mobility and bioavailability of some PHEs, and also promote biological activity.

4.04.P-Th261 Bioremediation of Polluted Soils with Petroleum Hydrocarbons by Four Spent Mushroom Substrates

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The remediation of polluted soils with petroleum hydrocarbons is a difficult and expensive task. The bioremediation of polluted soils is an attractive alternative to traditional techniques such as thermal desorption. The objective of this work was to assess the ability of four spent mushroom substrates (SMS) (*Lentinula edodes, Pleurotus ostreatus, Pleurotus eryngii* and *Agaricus bisporus*) to bioremediate a polluted soil from an oil refinery. This soil was sampled from a refinery in Huelva (Spain). Soil samples were mixed with SMSs at a rate of 10% in weight in reactors of 1L and incubated at 70% MWHC for 40 days at 20ºC in the dark. TPHs were extracted by microwaves using a mixture of acetone and n-hexane 1:1 (v/v). Fungal biomass was assessed by the ergosterol content. The ligninolytic activities determined were laccase, Mn-peroxidase and versatile peroxidase. Two enzyme activities were analyzed to assess the soil microbial activity, total hydrolase and dehydrogenase.

The soil was extensively colonized by *A. bisporus* and *P. eryngii*. In contrast, *P. ostreatus* and *L. edodes* showed low colonization. However, no significant differences in ergosterol were found between inoculated microcosms. The SMS of *A. bisporus* significantly enhanced the ligninolytic and microbial activity of the soil with respect to control soil. The biostimulatory effect of the other SMSs was low. The final concentration of TPHs was lower in the four amended soils than in the unamended

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