ABSTRACT BOOK
SETAC Europe 28th Annual Meeting

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This book compiles the abstracts from the platform and poster session presentations at the 28th Annual Meeting of the Society of Environmental Toxicology and Chemistry-Europe (SETAC Europe), conducted at the Rome Convention Centre La Nuvola, Rome, Italy, from 13 – 17 May 2018.
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 underlined.

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SOCIETY OF ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY
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; to timely and effective communication of
research, and to 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). Environmental Toxicology and Chemistry 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.
index and measured concentration in the Seine estuary were used together and allowed a categorization of compounds into 4 levels of environmental concern. Moreover, non-targeted analysis highlighted the formation of 794 compounds during 21 days of incubation, in high concentration level of SS condition. In order to improve risk assessment, formation of transformation products should have to be considered and included in prioritization schemes.

TU269
OECD 308 tests to explore differences in persistence of pharmaceuticals and microbially diverse between two rivers
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Persistent pharmaceuticals in aquatic ecosystems are of particular societal concern and the OECD 308 guideline is often used to obtain the biodegradation half-lives required for risk assessment. The environmental relevance of OECD 308 has been criticized regarding the difficulties applying to real estuarine microhabitats (benthic and abiotic) and the lack of compartment-specific half-lives for water or sediment as an outcome. In particular, biodegradation processes in the sediment can vary according to the microbial communities, which may be impacted by the settings chosen for the test (i.e. sediment-water ratio, aerobic-anoxic conditions and initial concentration levels). In this study, we have investigated the differences in biodegradation of a mixture of 9 pharmaceuticals (acetaminophen, caffeine, carbamazepine, diclofenac, flucloxazol, metformin, oxazepam, tramadol, and venlafaxine) using water and sediment collected from rivers Ryss and Grundback, before and after the discharge of a wastewater treatment plant (WWTP). Bottle incubations were set following the OECD 308 guideline, spiked with pharmaceuticals and incubated for 40 days at 16°C in the dark with daily aeration. Water samples were collected at 10 time points and analyzed in UPLC-CIMS. The microbial community composition in the sediment was analyzed with Illumina sequencing of bacterial 16S rRNA to provide more insight into the biodegradation potential in the different treatments. The dissipation half-lives observed for diclofenac, oxazepam, tramadol, and venlafaxine are significantly different (p < 0.001) between rivers and between locations. Additionally, the half-lives of non-stable treatments were significantly shorter than the OECD 90% for all compounds except carbamazepine, indicating that dissipation reflects a combination of biodegradation and sorption mechanisms. Furthermore, compound concentrations remained constant in river water treatments, with only caffeine and acetaminophen showing signs of degradation. Dissipation of pharmaceuticals in the sediment compartment is more relevant than in water for the 2 rivers. Although sorption cannot be completely excluded, the experiment results indicate that the biotic processes could be divergent between rivers, but also between sediments taken up-and downstream the WWTP. An analysis of the microbial diversity in sediment and water of each river will complement the differences in dissipation rates observed for the treatments.

TU270
Compartment-Specific Screening Tools - Development and Application to Assess Potential Persistence of Organic Compounds in Water, Sediment and Soil
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The persistence assessment under OECD 101 relies on compartment-specific degradation half-lives that are generally derived from aerobic laboratory simulation studies for surface, aquatic sediments or soil. Apart these data are given top priority, they are not available for most of the compounds since simulation tests are time-consuming and expensive, and they are required only for compounds with a production volume of 100 or more tons per year. Thus, screening information (e.g. results of worst-case biodegradability tests (WBTs) or quantitative structure-activity relationship models) are used in the absence of simulation test data to determine whether a substance is considered as "not persistent" or "potentially persistent" according to the screening criteria. However, WB-Ts only exist for the water compartment and QSAR models were mainly developed based on qualitative experimental biodegradation data related to water-only test systems. Therefore, half-lives for soil and sediment are calculated by multiplying the half-life in water by constant factors. However, this extrapolation is questionable due to different conditions in the compartments, which might affect biodegradation in connection with physico-chemical properties of the compounds. Consequently, there is a lack of experimental quantitative biodegradation data for soil and sediment at the screening test level. In the present work, compartment-specific screening tools for water-sediment (Water-Sediment Screening Tool, WST) and soil (Soil Screening Tool, SST) were developed based on the existing MITI test system (OECD TG 301C). The test systems MTT, WST and SST were applied to determine degradation data for a set of fifteen test compounds. The results demonstrate that the WST and the SST are suitable to determine sound and reliable biodegradation data including biodegradation kinetics for compounds on the screening test level. Furthermore, the results were used within the scope of a Compartment-Specific Persistence Screening (CSPS). The results of the CSPS were in good agreement with the REACH standard persistence screening, resulting in slightly more conservative but reasonable results. Thus, the data can be applied to identify potentially persistent compounds in the regulatory context. Beyond that, the results can be used as input parameters for multimedia fate models to assess the environmental fate of the compound, e.g. overall persistence (Peo).

TU271
Assessment of persistence of pesticides in Denmark
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Persistent active substances can affect the environment over long periods of time, as such substances can be distributed and accumulated within and outside the areas where they are used. Persistent substances constitute a long-term and difficult-to-quantify risk of spreading in the environment and affect organisms. Persistent substances can also cause effects on and lead to residues in subsequent food chains. A so-called metabolite may cause effects on an aquatic community. In Denmark, a DTSO above 180 days cannot be approved in the Danish assessment. The persistence evaluation is based on an assessment of available reliable half-lives from both laboratory and field studies. All half-lives should be normalized to 20°C and pH2. Assessment of persistence should not be based on average or percentiles of the data. Instead data are assessed by considering the soil types used and focusing on soil types representative for Danish conditions. If in general these soil types have a DTSO above 180 days, products with such active substances cannot be authorized for outdoor uses in Denmark. If only some of the soil DTS0 values are above 180 days, an ad hoc assessment is performed to decide if these findings constitute the major part of data and if it is likely that DTS0 for Danish soils is above 180 days under field conditions relevant to the intended use. The persistence evaluation should be performed for both the active substance and metabolites. However, the half-lives which fulfill certain criteria are considered to be of no concern regarding persistence.

TU272
Influence of Winter Conditions on Fungicide Persistence in North American Golf Courses Turfgrasses
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Fungicides are routinely applied to golf course turfgrass prior to winter in temperate climates around the world to protect the plants from psychrophilic plant pathogenic fungi. The persistence of these fungicides in the varying environmental conditions present during winter is poorly understood despite important implications for human and environmental health as well as disease control on the turf. A 3-year field study was initiated at the University of Wisconsin - Madison (Wisconsin, USA) in 2015 to determine which environmental conditions most influenced the persistence of the fungicides propiconazole and chlorothalonil. Folan concentration of both fungicides was measured using liquid chromatography-mass spectrometry, and a biosensor was conducted in a controlled environment chamber using the psychrophilic plant pathogenic fungus Microdochium natalense to determine the date when disease protection was lost. Fungicides were applied once on 20 Nov 2015 and again on 5 Dec 2016 and 10-cm diameter turfgrass cores were collected biweekly from the experimental area throughout each winter. Both winters experienced above-average temperatures in December with frequent rainfall events, and the concentrations of both fungicides in the turfgrass leaf tissue fell dramatically within the first 28 days after application. In addition, a corresponding increase in M. natalense disease symptoms in the controlled environment chamber was observed as fungicide concentration decreased. These results suggest that fungicides do not persist in winter conditions following rainfall events, though it remains unclear whether they persist for prolonged periods of time on frozen turf and under prolonged snow cover.

TU273
Biodegradability of novel graft copolymer with levan and polystyrene
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The significant increase in plastics production causes waste management problems which is particularly relevant for polystyrene plastic as the most dominant polymer in material. Therefore, investigating new biodegradable polymers is increasing. Graft copolymerization is important technique for physical and chemical modification of polymers. The microbial levan is biocompatible, biodegradable, renewable and eco-friendly fructose based polymer. It can be produced from sucrose by wide range of microorganisms using levansucrase enzyme. In the present study graft copolymer with microbial levan and polystyrene was synthesized, characterized and its biodegradable potential was investigated.
Levan was isolated after fermentation of Bacillus licheniformis strain. Syntheses of copolymer were performed by the free radical reaction using potassium peroxalate as initiator. Verification of the synthesis was recorded by 1H NMR Bruker AVANCE III 500 spectrometer. Biodegradation potential in aerobic conditions of obtained copolymer was investigated using Micro-Oxymetrex Respimeter (Columbus Instruments, Ohio). O2 consumption of samples mixed with soil was measured in period of 28 days. The 1H NMR spectrum of copolymer showed signals corresponded to both components. Consumption of O2 was higher in copolymer sample (70.5 G L) compared to control (50.9 L) and polystyrene (469.5 L) after 6 days. The toxicity of levan copolymer was confirmed by 1H NMR analysis. Results after 28 days in aerobic biodegradation in soil shows that obtained copolymer has biodegradation potential, however additional tests for biodegradation are needed.

TU274
Aerobic degradation of styrene-phenol in soil: influence of the temperature and of the characteristics of the soils
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The persistence of chemicals is assessed through their kinetic of degradation in the environment. Several simulation tests are available to evaluate the half-life of the chemicals in different environmental compartments. The half-life is then compared to the Annex XIII criteria of REACH to decide if the substance is considered as Persistent (P) or very Persistent (VP). Nevertheless, the interpretation of these tests is complex because several parameters may influence the kinetic of degradation despite a standardization of the methods in the present project. The rate and route of transformation of a styrene-phenol compound was investigated in different soils and at two temperatures: 15°C and 20°C under aerobic conditions. Statistical analysis was used to determine the influence of soil characteristics as endpoints: mineralization rate of the parent compound, kinetic of degradation of the parent compound, kinetic of degradation of the main metabolites, formation of non-extractable residues. In addition, the influence of the characteristics of the soil is assessed to evaluate the representativeness of those tests for the evaluation of the actual fate and behavior of such chemical in the environment.

TU275
Comparison of kinetics and products of degradation determined for the toluidineamine substances in the OECD-standardized ready biodegradability and sediment simulation tests
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The OECD ready biodegradability tests (RBT) are designed to approximate the rate/extent to which substances are degraded in the environment, such as is more precisely measured in the OECD simulation tests. This work compares results obtained from both test types for degradation of the toluidineamine (TDA) substances. Degradation of [14C]2- and 2,6-TDA was studied according to the OECD Guideline Nos. 301B and 308, wherein their disappearance, formation of degradation products, and evolution of CO2 were measured from initial doses of 0.5 mg/L. The 301B test used an inoculum collected from a domestic sewage treatment plant, while the 308 test used water/sediment collected from two diverse tributaries of the Rhine River. Disappearance of TDAs in the RBT followed pseudo-first-order kinetics. For the 2,6-TDA, half-lives for the 2- and 6- species were approximately 43 and 17 days, respectively. For 2,4-TDA, evolution of CO2 was equivalent to 4 and 7% of the applied radioactivity (AR) after 28 and 63 days, respectively, while that from 2,6-TDA was 12 and 24% of AR, respectively. The TDAs were removed by ~90% in the RBT, with the balance of AR associated with the biosolids. In the 308 test, the TDAs were rapidly transferred from their fully-dissolved state in water to a non-extractable residue (NER) in the sediments beneath. After the first 11 d, radioactivity in the river water was reduced to <10% of AR, several transiently formed degradation products were detected (tentatively identified by high resolution LC-MS), and NER accounted for ≥79% of AR for both TDAs in both river systems. Disappearance of TDAs was fitted to a dual-first-order-in-parallel kinetic model, with 50% depletion times (D50) of approximately 0.4 ± 0.1 and 0.7 ± 0.2 days determined for the 2,4- and 2,6- isomers, respectively, in both river systems. Yields of CO2 were ≤10.6% for AR of the 2,4-isomer and ≤8.3% for AR of the 2,4-isomer in both river systems after 100 d. In all cases, <1.5% of AR could be freed from the sediment using vigorous solvent extractions. The results of both test types show that the TDAs are not persistent in the environment, and are transformed by concurrent biodegradation and abiotic reactions. While the RBT gave a reasonably conservative approximation of the DT50 times and CO2 yields in aerobic surface water/sediment systems, it did not give a realistic representation of the fate mechanisms which result in formation of NER with natural organic matter in the environment.

TU276
Evidence for Anaerobic Microbiodegradation of PCBs and PBDEs in Sediment cores from an e-Waste Site, South China
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Biodegradation of polybrominated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs) is an important transformation and detoxification route in the environment. To better understand the in-situ microbial degradation of PCBs and PBDE in anaerobic sediment, three sediment cores from an e-waste dismantling site, South China, were sampled (named #1, #2, and #3, respectively). Positive matrix factorization model (PMF), compound-specific isotope analysis (CSIA), and microorganism analysis were used to trace the in-situ biodegradation of these pollutants. High levels of PCBs (44.0-700ng/g dw) and PBDEs (562-9300ng/g dw) were found in all the samples and the concentrations were generally increased from bottom to top layers. PMF analysis indicated that the technical mixtures are the dominant PCB and PBDE input and degradation takes place in the sediment cores, especially for PBDEs. This conclusion was supported by the microorganism analysis, substantial Dehalococcoides were found in the sediment cores. The relative abundance of Dehalococcoides for three sediment cores (#1, #2, #3) were 1.50-9.01%, 1.47-3.29%, and 0.20-2.55%, respectively, which were significantly correlated with the ratios of factor 2 (biodegradation source) /2 PBDEs (with the p values of 0.02, 0.05 and 0.01, respectively). As for CSIA analysis, only the stable carbon ratios (δ13C) of BDE 28, BDE47, BDE53, and BDE99 in the top 20cm of the #3 sediment cores were obtained. An increase in the δ13C values for BDE 28 and a slightly decrease in the δ13C values for BDE 85 were found with the increase of the depth sediment cores, indicating a potential biotransformation of these compounds in the cores. No significant differences in the δ13C values of BDE 47 and BDE 99 were observed in the sediment cores, possibly due to the complicated fate of these compounds, such as BDE47 and BDE99 being both reductants and products during the demethylation processes.

TU277
Transformation and degradation mechanism of flame retardant triphenyl phosphate in aquatic environment
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Organophosphorus flame retardants (OPFRs) in aquatic environment are concerned because they are latest alternative chemicals of brominated flame retardants. Among OPFRs, triphenyl phosphate (TPHP) shows high consumption values, as well as high concentration in water. TPHP caused toxic effects especially in aquatic organisms but research of biotransformation products is insufficient. Kinetic studies of TPHP and transformation products are important to understand the effects on aquatic organisms. To identify the biotransformation products of TPHP, Daphnia magna was used to standard test species in aquatic environment. TPHP was exposed to individual Daphnia magna and each samples were separated by biota and remaining medium. Daphnia magna were homogenized and remaining medium were extracted with solid phase extraction. Samples were analyzed using liquid chromatography-tandem mass spectrometry (LC/ESI-MS/MS) for quantification and ultra-high-performance liquid chromatography-electrospray high-resolution tandem mass spectrometry (UHPLC-HRMS/MS) for qualification. Two major biotransformation products were detected in the study based on phase I & II biotransformation mechanisms. Diphenyl phosphate (DPPH), product of phase I reaction, was identified for biotransformation products both biota and medium. Among phase II reaction, sultophenyl triphenyl phosphate was verified; intermediate metabolites were not significantly detected due to brief retention times. Parent compound (TPHP) and hydrolysis products (DPPH) were calculated by degradation ratios relative to control. Significant tendency were observed between TPHP and DPPH, as TPHP showed decreased, degradation product (DPPH) ratios increased. In conclusion, hydrolys and sulfation were major mechanisms for biotransformation products of TPHP in environment. As a result, the risk to aquatic organisms must be estimated in order to develop regulations for organophosphate flame retardants in aquatic system.

TU278
Photolytic and biological degradation of silicon organic compounds
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This study provides new data on the degradability and persistence of a selected group of partially new silicon organic compounds. Polysiloxanes are an important group of industrial chemicals, which are frequently produced in high amounts. They are widely used in industry, personal care products and agriculture. In general, siloxanes occur ubiquitous in the environment in different concentrations (e.g. in water from ng to mg per L). Since these polysiloxanes are only cleavable by chemicals, potential substances, which are better degradable in the environment, are urgently needed. Therefore, a partially new synthesized homogeneous group of siliconic organic compounds (p- MeOC2H5SiMe3, o-MeOC2H5SiMe3, p-MeOC2H5SiMe3, p-MeOC2H5SiMe3, o-MeOC2H5SiMe3, o-MeOC2H5SiMe3) with higher water solubility was investigated to provide new and reliable data on
Biodegradability of novel graft copolymer with levan and polystyrene

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Introduction & objectives

The significant increase in plastics production caused waste management problems which is particularly relevant for polystyrene plastic as the most dominant packaging material. Therefore, investigations of new biodegradable polymers are increasing. Graft copolymerization is important technique for physical and chemical modification of polymers [1]. The microbial levan is biocompatible, biodegradable, renewable and eco-friendly fructose based polymer. It can be produced from sucrose by wide range of microorganisms using levansucrase enzyme [2].

In the present study graft copolymer with microbial levan and polystyrene was synthesized, characterized and its biodegradable potential was investigated.

Materials & methods

Levan was isolated after fermentation of Bacillus licheniformis strain. After cultivation at 37 °C, polysaccharide was obtained by ethanol precipitation after biomass separation [3]. Syntheses of copolymer were performed by the free radical reaction using potassium persulfate (PPS) as initiator [4]. Verification of the synthesis was recorded by 13C NMR Bruker AVANCE III 500 spectrometer. Biodegradation potential in aerobic conditions of obtained copolymer was investigated using Micro-Oxymax respirometer (Columbus Instruments, Ohio). O2 consumption of samples mixed with soil was measured in period of 28 days.

Results & discussions

The 13C NMR spectrum of copolymer showed signals that corresponded to both components (Fig 2). The signals at 106 and 105 ppm corresponded to C-2 of 5-D-fructofuranosyl units (anomeric region), and the resonances from 82 to 62 ppm were related to C-5, C-3, C-4, C-6 and C-1, respectively [3]. The resonances with chemical shifts at 120–140 ppm were attributed to the carbons of the phenyl group in grafted polystyrene, and the signals at 40–44 ppm were assigned to aliphatic structure of polystyrene [5].

Figure 2. 13C NMR of levan-polystyrene graft copolymer

Figure 3. Cumulative consumption of O2 of control, polystyrene and copolymer.

Figure 3 shows cumulative consumption of O2 after respirometric measurements. Consumption of O2 was higher in copolymer sample (705.0 L) compared to control (350.9 L) and polystyrene (499.5 L) after 673 h.

Conclusions

The formation of levan and polystyrene graft copolymer was confirmed by 13C NMR analysis. Results after 28 days in aerobic biodegradation in soil shows that obtained novel copolymer has biodegradation potential, however additional tests for biodegradation are needed.

References:


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Figure 1. The reaction mechanisms in the system a) propagation and b) termination reactions.

Figure 3. Cumulative consumption of O2 of control, polystyrene and copolymer.