MO103
Evaluation of DEET cytotoxicity on Perna perna mussels
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Recent studies have identified the presence of several emerging pollutants in aquatic environments. The occurrence in different environmental matrices has been continuously reported, highlighting the need for toxicity studies. Developed in the 1940s and present in many commercially available formulations, the DEET (*N,N-diethyl-meta-toluamide*) is the active agent used in most insect repellents. Several studies have been identified the DEET presence in surface water and in wastewater treatment plant (WWTP) effluent, so this compound is considered an emerging pollutant and studies indicate that DEET is only slightly toxic to aquatic organisms. Even nowadays the environmental destiny of DEET is not completely understood. Although DEET is considered a compound resistant to degradation and commonly found in surface water, there are not complete assessments for ecological risk of DEET, including studies evaluating chronic toxicity to aquatic organisms. In this study was evaluated the DEET toxicity and the effects caused in lysosomes of *Perna perna* mussels hemocytes. For this purpose, firstly was performed the acute toxicity assay to identify the DEET concentration that causes 50% mortality of exposed organisms to DEET concentrations in the range of 75 to 400 mg L^{-1} and the obtained lethal dose (LC50) was 114.27 mg L^{-1}. To assess the stability of the lysosomal membrane in organisms exposed to this compound was carried out the cytotoxicity assay utilizing DEET concentrations in a range of 0.001 to 1.0 mg L^{-1}. In fact, is important reinforce that the data of DEET cytotoxicity showed disturbances in *Perna perna* mussels in all tested concentrations.

MO104
Phytotoxicity assessment of discharge waters: Focus on germination and root elongation tests
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Surface Treatment Industry is well known to be one of the largest chemicals and water consumer. It thus generates a large amount of complex and toxic waste water. Seed germination and root elongation tests, using as indicator higher plants like cucumber, radish, wheat and lettuce, are commonly used to evaluate their ecotoxicity. Indeed these bioassays present many advantages as they are simple, very reproductible, rapid and only require a small amount of sample. However these tests are carried out under national and international recommendations (US FDA, US EPA, OECD), some parameters remains variable. Our research group historically uses the lettuce *Lactuca sativa* (L.) as bio-indicator in ecotoxicological bio-monitoring. The aim of this study is to assess which factor(s) can be seen as critical in the water discharge toxicity evaluation. We particularly focus on control water quality, seed abundance or lettuce variety. We tested four waters as control (mineral, osmozed, ultra pure and distilled water) and three abundances (15, 20 and 30 seeds per Petri dish). After 7 days in controlled conditions (dark; 24°C±1°C), results show no significative differences on both germination rate and root elongation endpoints. Nevertheless, we find out that when watered with industrial waste water, the four lettuce varieties (Batavia dorée de printemps, Kinemontepas, Appia and Grosse Blonde Paresseuse), randomly chosen among more than 1500 commercial cultivars, show significatively different responses. From the comparison, it is clearly evident that a differential sensitivity scale exist among nor species but varieties.

MO105
Toxic potential of different types of sewage sludge as fertilizer in agriculture: ecotoxicological effects on aquatic and soil indicator species
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Phosphorus is a non-renewable, essential but limited resource for plant growth. Waste water and sewage sludge usually contain substantial concentrations of phosphorus. In order to use sewage sludge as a sustainable phosphorus resource for agriculture, it has to be proven that no ecotoxicological effects on target species in soil and receiving water bodies are generated. Therefore, three test species were chosen to cover the environmental compartments water, sediment and soil. To evaluate acute effects of sewage sludge on a higher aquatic plant, the duckweed *Lemna minor* was monitored via its growth inhibition, discoloration and colony break-up. Acute toxicity of sewage sludge in water and sediment was investigated with regard to mortality and behavior (movement activity and feeding behavior) of *Gammarus fossarum*, a key organism in stream ecosystems. The toxic effects of sewage sludge in soil on a decomposer - the earthworm (*Eisenia fetida)* - were monitored by its avoidance behavior. Chemical assessment included nutrients, organic micropollutants and heavy metals. \n For example, the assessment of a non-dewatered sludge resulted in an inhibition of growth of *Lemna minor* starting from 2,5 volume-percentage after 7 days (EC_{50}: 5,1% S). Concentrations below 1% supported plant growth (hormesis effect). *G. fossarum* displayed significantly decreased movement activity at 2 and 5% sludge concentration during an exposure time of 2 days, leading to decreased survival after 4 days of exposure in 2% sample concentration (LC_{50}: 1,95% S). After 2 days *E. fetida* exhibited an increased avoidance behavior of contaminated soil from 1% sewage sludge (EC_{50}: 1,7% S). 100% avoidance of contaminated soil was obtained at 5%. The dewatered sludges had a higher toxic effect on *E. fetida* and *G. fossarum* but a lower toxic effect on growth inhibition of *L. minor*. *G. fossarum* was the most sensitive species in the applied test setup.\n In conclusion, for all three test species all three sewage sludges tested have to be classified as toxic at high concentration levels under laboratory conditions. In order to get reliable information about practical doses for agricultural soil, field studies under real environmental conditions will be performed to verify the current results.\n The research project P-REX is supported by the European Commission under the Seventh Framework Programme (Priority: "From Prototype To Market"/ Contract No. 308645).

MO106
LogNormality of trace contaminant concentrations in sewage effluents
M. Gardner,
Summary: This poster summarises a detailed examination of the nature of the data frequency distributions of trace contaminant in wastewater treatment works' effluents. Cumulative distribution plots are illustrated for both between-works average values and within over 150 works. **Abstract:** It is important to understand the statistical distribution of monitoring data for them to be of value in determining the parameters of environmental models. No such distributional information has been available for many trace contaminants in sewage effluents. This work applies the data of a major UK sewage works' effluent monitoring programme to determine the validity of the common assumption that data are logNormally distributed. Effluent quality was monitored at 162 wastewater treatment works over one year, generating over 3,000 results for each of over forty substances, including metals, trace organic substances, pharmaceuticals etc. It is demonstrated that the logNormal assumption is clearly justified for the great majority of substances in the spatial case - for annual average effluent concentrations across different treatment works. In the site specific, temporal case – for individual determinations of concentration at a single site over an annual period – logNormality is generally supported, but not demonstrated so unequivocally for all site/substance combinations. The principal source of uncertainty for within works data was lack of sufficient numbers of observations reported to adequately low reporting limits.

MO107
Detection and fate of synthetic musks in wastewater treatment plants – a review
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Synthetic musks are used as fragrance additives and fixative compounds in personal care (e.g. perfumes, lotions, shampoos, deodorants) and household products (e.g. detergents, fabric softeners, air fresheners). Due to their high incidence and widespread use, synthetic musks are continuously introduced into the environment, mainly through urban sewer systems. Since these compounds are pseudo-persistent, bioaccumulative, have a lipophilic nature and are only partially biodegradable, they are usually not completely removed when they reach wastewater treatment plants (WWTPs). Therefore, their effluents are the main source of contamination. In fact, the use of biosolids as fertilizers in agricultural fields is a direct input of musks into the soil, whereas the wastewater effluents discharges are the major route for surface water contamination. To the author's best knowledge, this is the first compilation of studies about concentration levels and fate of synthetic musks in WWTPs and discusses the efficiency of the traditional removal methodologies applied in these plants. In this study, it was seen that polycyclic musks are the most detected, namely galaxolide (HHCB), tonalide (AHTN) and DPMI (cashmeran). They are found in effluents at concentrations from 5 to 10525 ng/L. Nitromusks are detected in a small number of effluents, but when detected, their concentrations ranged from 0.3 to 542 ng/L in wastewater. The most detected are musk xylene (MX) and musk ketone (MK). As expected, due to their lipophilic behaviour, musk compounds tend to accumulate mainly in sludge (0.05 - 117000 ng/g). Although synthetic musks were studied throughout the entire WWTP system, only a few studies dealt with measurements of the surrounding air. These revealed that musk compounds tend to accumulate in the gas-phase (0.23 – 344306 ng/m^3), being HHCB and AHTN the prevailing ones. Looking at the different stages of a traditional WWTP, secondary treatment is the process that most contributes for the removal of these kind of compounds, mainly due to sorption onto sludge. Acknowledgements The authors wish to thank Fundação para a Ciência e a Tecnologia (FCT - Portugal) for the project PTDC/AGR-CFL/102597/2008 and grant SFRH/BPD/76974/2011. This work has been partially funded by the European Union Seventh Framework Programme-Marie Curie COFUND (FP7/2007-2013) under UMU Incoming Mobility Programme ACTion (U-IMPACT) Grant Agreement 267143.

MO108

Record sediment concentration of retene, a highly potent fish teratogen, is buried into a lake site near closed pulp factory in Fennoscandia
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Lake Lievestuoreenjärvi (LLTJ) with the pulp factory on its shore, closed in 1985, is a national landmark of environmental history in Finland. During years of its operation since 1927, primarily by sulphite process , production of chlorine bleached softwood pulp resulted effluent discharges to LLTJ. In 2009, we sampled a 30 cm cores from the deposited sediment in the nearest deep (19 m), and sliced it into 2.5 cm subsamples for GC-MS analyses of wood- and municipality-derived chemomarkers. The highest concentration of retene (5765 μg/g dry w.) was found in the layer 10-12.5 cm, similar to the maximum of total resin acids, RAs (3532 μg/g; dominated by dehydroabietic acid, the primary precursor of retene). The uppermost core section, above 7.5 cm, contained dramatically lesser concentrations of any wood-derived extractive. While microbial aromatization of RAs into retene (7-isopropyl-1-methyl phenantrene) requires anaerobic conditions, we suggest that, besides evoked serious hypoxia due to pulpmill effluents, the domestic sewage discharged from the nearby village Lievestuore (ca. 3000 inhabitants) has maintained over decades the formation of retene inside burying sediment layers. This deduction is supported by synchronic presence of cholesterol and coprostanol , two human origin sterols, in the same layers with industrial wood extractives.

MO109
Automated detection of suspected and non-targeted metabolites in sewage water after biological and chemical treatment
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Water purification and treatment of sewage water is a well-known topic to the scientific community for a long time. Nevertheless, the question of the fate of contaminants in the different stages of treatment remains a complex matter and an analytical challenge. Triple stage quadrupole mass spectrometry equipment enables analytical chemists to conduct searches for known and suspected metabolites and transformation products, but separation from matrix signals stays critical and result confirmation difficult. The ongoing development of high resolution accurate mass (HRAM) mass spectrometric instrumentation (Orbitrap, TOF) opens up the door to more sophisticated ways of detection and confirmation of contaminants and their metabolites and transformation products, respectively. With these instruments, the detection mostly is done in full scan experiments, accompanied by different types of fragment scans for additional processing and confirmation. The power of resolution serves for unambiguous separation from the surrounding matrix signals, while mass accuracy is the key for reliable identification, including the isotope pattern for confirmation. Since all steps of detection, identification and confirmation take place post acquisition, the bottleneck is found to be the ability to process large amounts of data in appropriate time. For this study we took different water samples from a waste water treatment plant in western Germany with biological and chemical (ozonation) treatment facilities. We show how data, acquired with bench top Orbitrap HRAM LC-MS instrumentation can be analyzed in a fully automated matter with Thermo Scientific Compound Discoverer™ software. We show how the targeted search for known and suspected metabolites and transformation products by application of known and postulated biological and chemical transformation steps can be carried out easily in short time. Additionally, we show the detection of putative transformation products unknown so far by application of a generic component detection algorithm and application of mass defect filtering for specific parent components.

MO110
UKWIR Chemicals Investigation Programme – Phase 2 - from generic assessment to specific characterisation of effluent quality
M. Gardner; A. Thornton, Atkins Limited; L. Wilson,
Summary: This poster summarises the developing approach adopted in the UK to challenges posed by management of chemical in wastewaters. Where previous investigation focused on characterisation of effluent quality in terms of the presence and variability of substances in effluents, work currently in progress has moved in the direction of action to manage contamination. **Abstract:** Phase 1 of the UKWIR Chemicals Investigation Programme has provided a generic overview of trace contaminant concentrations in UK wastewater treatment works effluents, the effectiveness of current treatment processes in reducing contaminant concentrations and a novel insight into the sources of substances in sewer catchments. The second phase of this programme (CIP2) has been developed as an extension and expansion of an already substantial (€30M) CIP1 programme. The risk-based approach that has been widely used to scope the scale of measures required to meet Environmental Quality Standards (EQSs) for trace contaminants must now be supplanted with a clear view of actual environmental status. In order to meet this challenge, it is necessary to gather a suitably substantial and reliable body of evidence relating to compliance with quality standards. The intention is that resources expended in these investigations will ensure that the potentially far greater investment in possible remedial action will be directed where it can be shown that there is a demonstrable need and where responsibility can be apportioned such that the "polluter pays". Equally importantly, the data from CIP2 should make it possible to differentiate between sites where the case for action is clearly demonstrated and those where it is weak or non-existent. The way in which monitoring will be supported by definition of clear strategies for stakeholder engagement in substance source control and scoping of further improvement or upgrading of wastewater treatment processes, will also be described.

MO111
Persistence of wastewater-related xenobiotics during transport along an urban river segment
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Xenobiotics are increasingly produced by industrial processes and introduced into the environment. Many of them are not completely eliminated by conventional waste water treatment plants (WWTP) and enter the receiving waters by WWTP outfalls or combined sewer overflows. In many cases, little is known about their toxicity, persistence and transport behavior in aquatic systems. In this study, the behavior of selected organic pollutants along a 4 km long urban river segment was studied by an experimental approach. The Steinlach River in southwest Germany with a total catchment area of 140 km^2 receives treated wastewater from a WWTP a couple of kilometers upstream of its confluence with the Neckar River. In its further course, the river channel is largely straightened and does not receive any larger tributaries. For this segment, a detailed mass balance was determined over a complete 24 h cycle. To this end, 2 h composite samples (sampling interval: 15 min) were taken using automated samplers at the upstream and downstream ends of the segment, respectively, and analyzed in the lab. A model-based analysis of the data demonstrated, on the one hand, that substances were persistent to a variable degree during the transport along the river segment. On the other hand, transformation processes seemed to be dependent on the time of day. The investigated compounds could be separated into a conservative (e.g. the phosphorous flame retardants TCPP und TDCPP and the pharmaceutical carbamazepine) and a reactive group. The latter comprised substances that were eliminated mainly during daytime (e.g. the disinfectant triclosane und das phosphorous flame retardant TDCP) and others that were transformed as well during nighttime (e.g. the synthetic fragrance HHCB and the pharmaceutical oxcarbazepine). A likely explanation is the variable sensitivity to photodegradation. Next steps will be a more detailed investigation of the processes involved and the factors regulating them. Also toxicological potentials and effects will be further studied.

MO112
Source Apportionment of Trace Contaminants in Urban Sewer Catchments
S. Comber, Plymouth University / Environmental Science; M. Gardner; V. Jones, Atkins Ltd; B. Ellor, UKWIR
Sampling and analysis of Water Framework Directive priority chemicals was undertaken in 9 urban catchments across the UK. Over 9,000 samples were collected from a number of different catchment sources including tap water, domestic waste water, surface water runoff, trade discharges, town centre and light industrial estate wastewaters. Determinands included the main trace metals of interest, PAHs, persistent organic pollutants and a number of common pharmaceuticals, as well as the common wastewater constituents including nutrients, organic carbon, BOD, COD and suspended solids. Loads of the chemicals from each catchment entering the local wastewater treatment works were estimated and were shown to be relatively consistent between different catchments after taking population into account. The study highlighted the importance of domestic wastewater as a source of contaminants, including metals and trace organic substances (such as EDTA, bisphenol A, nonylphenol and TBT). Concentrations in trade discharges were important in some locations in the cases of nonylphenol, EDTA, TBT as well as for some metals such as copper, zinc and nickel. Runoff exhibited significant concentrations of PAHs, lead, and TBT. Contributions to the total load from town centre and light industrial estate sources were generally less than 10% of the total.

MO113
Long-term monitoring of volatile methylsiloxanes (VMS) in aquatic environments impacted by wastewater effluent: experimental design and results from the first three years of collection.
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