respectively. Decreased female E2 and VTG levels and gonadal CYP 19 (aromatase) activity were also found in sediment exposed females from both species. No effect on female 3/17-HSD activity was found in either species. Solar powered, diffuse, small bubble aeration was installed within one freshwater, and subsequently, in one saltwater pond. PAH, OPAH, and anaerobic degradation product levels were monitored over the course of 1.5 years and post-remediation modified FSTRA was used to assess remediation status of the freshwater pond. Reproductive performance and endocrine endpoints were similar to control sediment levels indicative of successful remediation. PAH, OPAH, and anaerobic degradation product levels are being monitored in the saltwater pond. Modified FSTRA will be used similarly to assess remediation success.

TP028 Cadmium and BPA in vivo exposures alter endocrine related genes in the freshwater snail Physa acuta. New biomarker genes in a new model organism

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The freshwater snail Physa acuta is a sensitive organism to xenobiotics and appropriate for aquatic toxicity testing in environmental studies. There is scarce genomic information on P. acuta so in this work we identify several genes related with the hormonal system to evaluate the effects of Cadmium (Cd) and Bisphenol A (BPA), pollutants frequently found in aquatic environments. Endocrine-disrupting chemicals (EDCs) can affect the synthesis or secretion of hormones and alter their endogenous functions. We have selected two compounds with known endocrine-disrupting activity in vertebrates to analyze their potential effect on the Gastropoda endocrine system. The transcriptional activity of the endocrine related genes estrogen receptor (ER), estrogen-related receptor (ERR), and retinoid X receptor (RXR) were analyzed in P. acuta exposed to Cd and BPA. Real time reverse transcriptase-polymerase chain reaction (qRT-PCR) analysis showed that Cd and BPA presence altered the expression pattern of ER, ERR, and RXR mRNAs, suggesting a putative mode of action that could explain the endocrine disruptor activity of these xenobiotic at a molecular level on Gastropoda. These data provide, for the first time, information about the effects of Cd and BPA on the endocrine system of Gastropoda and suggest that ER, ERR and RxR genes could be a potential biomarkers of exposure to compounds with activity as endocrine disruptors. Acknowledgements: Funded by CTM-2015-64913-R from the Ciencias y Tecnologías Medioambientales program (SPAIN).

TP029 Advantages and Challenges for Determining Mode of Action of Industrial Chemicals: A Case Study with Alkylphenol and Alkylphenol Ethoxylates

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Determining the mode of action for environmental contaminants is increasingly important in the field of environmental toxicology for several reasons including, but not limited to: 1) potential future use of predictive toxicity methodologies which are based on molecular initiating events and modes of toxic action, 2) refining the assessment of the hazards of environmental mixtures in the environment, and 3) consideration of proposals for hazard based approaches to regulating chemicals based on perceived mode of action. While the mode of action of pharmaceuticals and pesticide active chemistries may be relatively straight-forward based on their design for efficacy with a selection toward minimizing non-target effects, industrial chemicals present unique challenges. This case study will examine Alkylphenols (APs) and low mole alkylphenol ethoxylates (APEs), which are environmental degradants of the higher mole APEs used as detergents, emulsifiers, wetting agents and dispersing agents in industrial chemical formulations. AP and low mole APE are known to have weak estrogenic activity; however, this is not the only or even the primary mode of action that is linked to adverse effects in environmental species Several lines of evidence will be presented that can be used to elucidate the mode of action of these and other industrial chemicals. High through-put toxicity screening, acute to chronic ratios, weight of evidence evaluations based on chronic toxicity data from various taxa (i.e. mammalian, fish, invertebrate and plant), and "omic" data will be used to make the case that for many industrial chemicals, a "lead" toxic mode of action may be hard to identify. Recommendations for determining modes of action for industrial chemicals and implications for regulatory aspects will be discussed.

TP030 Screening, Prioritizing, and Classifying EDCs: A comparison of international efforts to identify endocrine disrupting chemicals

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To date, a wide variety of organizations across multiple sectors around the world have published reports and communications proposing lists of chemicals that they have labeled as endocrine disrupting chemicals (EDCs) or suggested as potential EDCs. For example, government agencies from multiple countries have established their own priority chemical lists, screening programs, and/or knowledge bases to assist with ongoing research and pending management measures. Some industry bodies have also reviewed the topic and published their own lists for self-regulation within the respective sector. The intended purpose, selection criteria used to create these lists, and details included differ considerably among them. In this study, we have reviewed and consolidated in total over fifteen existing lists in the public domain. In particular, we aim to step back and gain an overview of the global efforts being made to identify and classify EDCs and to establish which chemicals have received the most consensus and evidence for being EDCs or should be prioritized for assessment in the foreseeable future. From the evaluation, we noted that while many lists have already been heavily developed and publicized, others are planned or currently in early development stages. Clarity of the selection criteria was also found to be varied, with some lists discussing the exact methodology used and others citing some form of expert consultation or not disclosing clear criteria. Multi-stakeholder consultation (through government, business, and/or community input) also occurred during the development of some, especially those that have direct regulatory impacts. Other differentiating factors include whether a list is static or changeable, homogenous or further sub-classified, and EDC-focused or more universal. Our comparison demonstrates that significant resources have been and are being invested into identifying and understanding EDCs, as reflected by the number and diversity of these lists. Simultaneously, it also highlights inconsistencies in methods being used, the lack of input from developing and transition countries, and the need for further clarification of the meaning and purposes of the lists.

Birds as Indicators of Environmental Change: Molecular to Population Effects of Contaminant Exposure and other Stressors

TP031 Levels of legacy and emerging organohalogenated compounds in Northern goshawk and White-tailed eagle nestlings from different latitudes in Europe

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Since the ban of several organohalogenated compounds (OHCs), industries have produced unrestricted alternatives that are also emerging in the environment, including birds. To assess to which degree these

compounds are present in birds of prey, nestlings of Northern goshawk (NG; Accipiter gentilis) and White-tailed eagle (WTE; Haliaeetus albicilla) were investigated for exposure to legacy and emerging OHCs. Birds were sampled over a latitudinal gradient in Spain (NG: Murcia at 38°N) and in different locations in Norway (NG: Trøndelag at 63°N, Troms at 70°N; WTE: Smøla at 63°N, Steigen at 67°N). Blood and body feathers were taken as non-destructive sampling methods. Polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), dichlorodiphenyltrichloroethane and metabolites (DDXs), chlordanes (CHLs), hexachlorobenzene (HCB) and hexachlorohexanes (HCHs), together with emerging compounds, such as novel brominated flame retardants (NBFRs), dechlorane plus (DP) and phosphorus flame retardants (PFRs), were analysed using gas chromatography-mass spectrometry. The total OHC load in feathers of NG was twice as high in the northernmost location Troms (280 [181-518] ng g^{-1} dw) as in Trøndelag (93 [52-165] ng g^{-1} dw) and Murcia (103 [55-198] ng g^{-1} dw). This pattern differed in plasma, as Trøndelag had the highest OHC load (11 [1.8-40] ng mL^{-1}), followed by Troms (7.6 [1.4-35] ng mL^{-1}) and Murcia (3.2 [1.2-21] ng mL^{-1}). In WTE, birds from Steigen had the highest OHC load in both matrices, with plasma concentrations twice as high as in Smøla (11 [6.3-115] and 4.1 [1.8-15] ng mL^{-1}, resp.). In both species, PFRs were by far the major contributors to the total OHC load in feathers (36-84%). Other major contaminant groups were DDXs and PCBs (or HCHs in Murcia). The most dominant compounds of each group found in feathers of both species were tris(1-chloro-2-isopropyl)phosphate, p,p'-DDE, CB153, BDE47, oxychlordane (OxC) and β- and γ-HCH. In plasma, DDX and PCBs were the main contaminant groups (≥95% of the total OHC load) and CB153, CB180, p,p'-DDE, OxC, BDE99, BDE47 and β-HCH were the dominating compounds. PFRs in plasma were only detected in WTE from Steigen. In general, feather concentrations exceeded those in plasma, especially PFRs. This could be due to accumulation in feathers during feather growth or external contamination. Also, fewer compounds were detected in Spain than in Norway, suggesting further investigation of geographical exposure patterns.

TP032 Assessing Cholinesterase (ChE) activity in the Humboldt penguin (Spheniscus humboldti) from Punta San Juan de Marcona, Ica, Peru

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The use of current used pesticides with associated misuse and overuse in operational applications have resulted in the contamination of land, freshwater and coastal areas of the Pacific coast of South America. The toxic effects and persistence of these compounds in the marine environment are scarcely known in Peru. Exposure to organophosphorus (OP) and carbamates (CB) can inhibit the function of acetylcholinesterase (AChE), the enzyme responsible for neurotransmission, causing mortality or lethal effects in organisms. With the aim to determine baseline information on the normal activity of cholinesterase (ChE) in free-ranging Humboldt penguins (Spheniscus humboldti), we assessed ChE activity levels and whether body condition and sex of individuals are factors influencing ChE in penguins. Blood samples were collected from 17 males and 18 adult females in 4 areas of the Reserve Punta San Juan in Ica, Peru. Sampled penguins were considered clinically healthy. Samples were centrifuged and serum collected for biochemical analysis. We used generalized linear mixed models to explore the influence of sex, body condition and sampling location on the values of ChE. Body weight was included as a covariate, and the area as a random factor. The enzymatic activity was expressed in units (U) per L of serum (i.e. 1 U is a µmol of substrate hydrolyzed per minute). Mean concentrations of ChE ranged from 1248 ± 264 U/L (1.25 ± 0.3 U/mL) to 1413 ± 196 U/L (1.40 ± 0.2 U/mL), with a minimum concentration of 618 U/L (0.60 U/mL). Males had lower cholinesterase levels relative to those detected in females. However, the relationship between body weight and ChE should be interpreted with caution. While the association of ChE activity found in our penguins to ChE inhibiting pesticides or anti-cholinesterase compounds is scarcely understood due to the lack of background values and thresholds related to pesticides applications or chemical assaults in the region, our study reveals the first baseline that can be used as reference for ChE activity as a potential biomarker in Humboldt penguins as well as for wildlife and ecotoxicological risk-assessment. The range of ChE activity found here may be considered as basal levels for non-exposed penguins or penguins relatively exposed to low levels of pesticides (OP or CB) from unidentified local sources, highlighting the use of this seabird species as a sentinel to monitor the state of the health of the coastal-marine ecosystem along the Peruvian coast.

TP033 Useful biomarkers in sentinel European starlings (Sturnus vulgaris) exposed to vehicle exhaust emissions

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The health effects of air pollutants have been established in common laboratory species for many individual compounds, and at excessive (unnatural) concentrations. Epidemiological studies are identifying relationships between inflammatory disease syndromes in humans and air pollutants such as oxides of nitrogen and sulphur, and fine (respirable) particulate matter. There is very little information available on the effects of realistic pollutant mixtures on wildlife, particularly from experimental exposures. Wild-caught, adult European starlings (Sturnus vulgaris) were divided into two groups of approximately 30 birds each to study the effects of vehicle emissions on wild passerines. Experimental and reference groups were housed and managed under the same conditions, controlling for the effects of vehicle noise, lighting and temperatures. The experimental group was exposed to vehicle exhaust diluted to simulate maximum ambient urban air concentrations, vented through their enclosure for five hours per day for one month. Body condition (using scaled mass index), cell- and antibody-mediated immune responses, and hormonal responses were assessed as non-lethal indicators of toxicologic effects, whereas hepatic detoxification enzymes (EROD), measures of oxidative stress (TBARS, GSH) and the histopathology of selected tissues provide insight into other possible biomarkers. Early results indicate a significantly reduced response to the PHA skin test of cell mediated immunity. Other responses in the contaminant exposed birds compared to the controls will be presented based on these hormonal and toxicological biomarkers. As well, we describe the experimental setup, and provide recommendations for future studies of exposure to air pollutants.

TP034 The Use of Homing Pigeons as a Biomonitor for Atmospheric POPs in Guangzhou, China

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With the worsening air quality in China, it is essential to monitor the contaminants of concern in the atmosphere, especially in the megacities. Traditional atmospheric monitoring, such as using passive air samplers provides the concentration data in gaseous phase and particulate phase, but lacks the consideration about bioavailability, not to mention assessing toxicity risk of long-time exposure. Instead, biomonitoring with homing pigeons raised in urban area could be served as a suitable biomonitor of air pollution in cities. First, the homing ability makes homing pigeons live in their birth places during lifetime and keep exposing in air in the target area. Second, every homing pigeon has a foot ring recording its birth information, and usually they can live more than ten years. Last,