Abstract Book

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This book comprises the abstracts of the presentations for the platform and poster sessions of the Society of Environmental Toxicology and Chemistry (SETAC) Latin America 11th Biennial Meeting, conducted at the “Usina del Arte” in Buenos Aires, 7–10 September 2015. The abstracts are reproduced as accepted by the Scientific Program Committee and appear in numerical order.

In each abstract, the presenting author’s name is underlined. The author index cross-references the corresponding abstract numbers. Affiliation, session, and keyword indices are also included.
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- Support the development of ecologically acceptable practices and principles
- Provide a forum (meetings and publications) for communication among professionals in government, business, academia, and other segments of society involved in the use, protection, and management of our environment

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Environmental Quality Through Science®
Plenary Lecture Abstracts


J. Giesy, University of Saskatchewan / Department of Veterinary and Biomedical Sciences and Toxicology Centre

Prof. Giesy has affected your life and that of every living thing on the planet. This is the story of how he applied state of the art chemical methods of mass spectrometry and molecular biology to determine the status and trends of concentrations in the environment and worked out the mechanisms of toxicity and bioaccumulation. Additionally, thresholds, toxicokinetics, and bioassessments of PFOS were assessed. This is the scientific and political story of how a very valuable chemical used in many processes was ultimately banned and the public hardly knew anything had happened. By using a combination of chemistry and biology and ultimately developing a substitute I was able to get a chemical with a bad environmental profile out of the environment and you can still buy all of the electronics that affect our lives on a daily basis. Perfluorocane sulfonate (PFOS) has been found in tissues of humans and wildlife species in many parts of the world. Because of its low vapor pressure and the fact that it was used in polymers that were thought to be inert it was not expected to move in the environment or be accumulated into animals. Furthermore, accurate and sensitive analytical methods were unavailable until they were developed by my group. For these reasons little information on the environmental fate of PFOS was available. Here, I present the story of how I discovered this chemical in the environment, and then conducted a global survey and worked out the mechanism of action and thresholds for toxicity. I will provide chemical-physical properties of PFOS and discovered more traits, for instance, a compound neutral, di-aromatic halogenated compounds. I will discuss the reasons for why this global catastrophe occurred through a failure to understand the chemistry and toxicology of a whole class of chemicals. It was a failure of science and policies and ultimately discovered through serendipity. A series of controlled laboratory studies were conducted to determine the toxicity of PFOS to aquatic organisms, birds and mammals. From this information threshold concentrations for the protection of aquatic life were developed. By using toxicity information for mammals and birds toxicity reference values were developed based on concentrations in tissues, including liver, blood plasma and eggs were developed. By applying biaccumulation factors, concentrations of PFOS in water predicted to protect predatory birds and mammals were also determined. Concentrations of PFOS in waters and tissues of different species from different habitats, eco-regions and trophic levels were determined and compared to the threshold values to determine the margin of safety of current concentrations of PFOS in a range of environments. Specifically, the risk assessment of mixtures of perfluorinated compounds (PFCs) will be discussed and the potential of developing a toxic equivalency approach will be presented. PFOS and chemicals that degrade to PFOS are now listed in Appendix B of the Stockholm Protocol and 87 chemicals are now banned in Canada. Concentrations of PFOS in the environment are declining.

PL2. Fate, Effects and Management of Emerging Contaminants and Risks in River Catchments under Water Scarcity: The GLOBAQUA project

D. Barceló, IQAB-CSIC / Dept Environmental Chemistry

Most ecosystems are exposed simultaneously to several stressors, in the so-called multiple-stress situations. Some stressors such as water scarcity can limit biodiversity and economic activities in entire regions. In addition of being a stressor on its own, water scarcity can drive the effects of other stressors acting upon river ecosystems. It leads to intermittency in water flow, and therefore has implications for hydrologic connectivity, negative side-effects on biodiversity, water quality, and river ecosystem functioning. Water scarcity can amplify the effects of water pollution by reducing the natural diluting capacity of rivers. Interactions between stressors may be exacerbated by climate change. For instance, warmer temperatures and reduced river flows will likely increase the physiological burden of pollution on the aquatic biota, and biological feedback between stressors (e.g. climate change and nutrient pollution) may produce unexpected outcomes. Degradation of drainage basins, destruction of natural habitats, over-exploitation of fish populations and other natural resources, or the establishment of invasive species, are factors whose impacts combine and may give rise to synergistic effects, especially during periods of water shortage. The effects of these stressors are very relevant for the chemical and ecological status of water bodies as well as for the sustainability of ecosystem services they provide. Water scarcity is a key stressor with direct and indirect effects. The relevance of water scarcity as a stressor is most important in semi-arid and arid regions such as the Mediterranean basin, characterized by highly variable river flows and the periodic occurrence of low flows and even no-flows. Climate change provisions forecast an increase in the frequency and magnitude of extreme events. Although extremes are part of the normal hydrologic behaviour in Mediterranean-type rivers, many already show a consistent trend towards decreased discharge. This presentation will show different examples on the risk of emerging contaminants and nanomaterials in Mediterranean river catchments affected by water scarcity. For example the relevance of environmental factors (light, temperature, water flow) and chemical stressors (nutrients, pharmaceuticals, endocrine disruptors, pesticides, perfluorinated compounds and heavy metals) in the structure and functioning of epilithic biofilms in four Mediterranean watersheds, Ebro, Gualdalquivir, Jucar, Llobregat and Evrotas will be shown. Relevant data on Emerging Contaminants and Nanomaterials on these European river catchments, Adige and Sava will be reported too. Stressors co-occur and interact in specific manners, and the respective relevance of one or another in the response of the biota may be altered also by the flow regime. Finally, management solutions will be addressed, including the use of additional advanced treatment technologies for removal of pharmaceuticals and antibiotic resistance genes from wastewaters and recommendations of low-dose prescription of medicines.

PL3. Combining greenhouse gases emission mitigation and health co-benefits due to reduction of local air pollutants: a global perspective

P. Saldiva, Universidade de Sao Paulo

Health co-benefits of policies designed to reduce GHG emissions are well recognized. Active transportation, improvements in household energy efficiency and low emission power plants are classic examples of measures that promote significant and immediate positive effects on human health. However, the potential of other health co-benefits of GHG mitigation has been largely underestimated. Differences in the technology employed to produce energy and mobility lead to a condition that for a given amount of GHG emission developing countries usually produce substantially higher levels of particles and ozone precursors, ambient pollutants with robust associations with adverse health effects. High population density and high levels of ambient air pollution is a frequent combination in the megacities of developing countries, increasing the vulnerability of urban dwellers in these hot spots of elevated exposure intensity. Thus, GHG policies that result in simultaneous reduction in local air pollutants have a marked positive health impact particularly in regions with low technologic efficiency. These health benefits reduce the economic burden of disease and should be taken into account when implementing public policies aimed to GHG mitigation, mainly in a scenario where local governance deals with limited resources. In this presentation, local examples will be presented to illustrate the potential use of health co-benefits to drive GHG mitigation policies. In addition, some aspects of the global pattern of technological inefficiency of energy production will be presented to provide a snapshot of where scientific and technologic partnerships will promote significant health co-benefits.

PL4. Neuroendocrine Disruption: Causes and Consequences for Vertebrate Reproduction

V. Ladenius, University of Ottawa / Advanced Research in Environmental Genomics

Industrial pollutants, agricultural pesticides, pharmaceuticals and other chemicals are ubiquitously present in the environment. PFOS was detected at all levels, from water to soil to air to animal and human tissues. We have proposed that the term ‘neuroendocrine disruption’ extends the concept of endocrine disruption to include the full breadth of integrative animal physiology. Upsets to normal homeostatic mechanisms following exposure to environmental pollutants can affect an animal’s ability to undergo reproduction or develop normally, and may lead to transgenerational deficits. Results from various laboratories around the world will be drawn upon as examples of neuroendocrine disruption with reproductive consequences. Fluoxetine and other antidepressants are environmental contaminants that disrupt reproduction, behaviour and metabolism in teleost fish, demonstrating the complex and pervasive effects of neuroactive pollutants. Adult zebrafish (Danio rerio) exposed to fluoxetine only during serotoninergic system development (0-6 dpf) display more anxiety-like behaviours and have reduced cortisol production. Bisphenol A (BPA) is an example of an abundant plasticizer pollutant that has been documented to affect diverse species. Data from mammalian models demonstrate profound effects on reproduction. Gestational exposure to low doses of BPA decreases vasopressin expression in embryonic mouse brains and increases social investigations in juveniles during tests of social recognition. These BPA-induced changes persist in the F3 generation. BPA can also disrupt socio-sexual behaviours. Male deer mice developmentally exposed to BPA are more aggressive towards females. Several other emerging data suggest that neuroactive environmental pollutants adversely affect diverse neuroendocrine processes across taxa and generations.
Outstanding Talk Abstracts

OT1. Análisis de Riesgo al Medio Ambiente Minero: Una esquema para la evaluación de los efectos potenciales de la minería al medio ambiente
T.P. Boyle, Terence Boyle

Usualmente los impactos potenciales de minería se dirigen por Environmental Impact Assessments (EIA), que en países desarrollados tienen muchas veces un montón de datos de medio ambiente de base, pero les falta la habilidad para dirigirse a los problemas de impactos potenciales que resultan de las actividades de la minería. También la EIA muchas veces es una actividad completamente separada de la planificación y el desarrollo de una mina. Hoy en día el análisis de riesgo está aplicado algunos desarrollos económicos e industriales sobre la vida de la actividad o ciclo de vida análisis para la planificación y protección de la salud del medio ambiente y humana. Este trabajo elabora el paradigma del análisis de riesgo para definir impactos potenciales durante etapas tempranas de actividades mineras, y sugerir datos necesarios para el análisis de riesgo para la planificación, desarrollo, y la operación de la mina. Análisis de riesgo tiene la ventaja de simplicidad en principio y es entendible a una variedad de actores (e.g., empresas de minería, agencias de reglas, organizaciones non-gubernamentales, indígenas, y ciudadanos interesados). Análisis de riesgo encuadra y obliga el complejo de tecnología y la integración científica necesarias para identificar y evaluar estresores específicos al medio ambiente y la salud humana. La estrategia presentada acá para planear el desarrollo de minas nuevas se dirige al riesgo asociado con las varias etapas en la vida de una mina como: 1) exploración, 2) desarrollo del cuerpo de mena, 3) extracción de la filón, 4) procesamiento de la mena, and 5) cierre de la mina. Estas etapas progresan a una escala geográfica más y más pequeña y limitada empezando con comarca, entonces distrito minero, cuenca, y finalmente cuerpo de la mena. Identifica amenazas individuos, ambos físicas y químicas, usando modelos geo-environmental, la evaluación de ácido-base de la filón y rocas en la vecindad, y el potencial para liberar y la exposición por metales pesados, identificación de modos o sendas de exposición, y la identificación de receptores ecológicos y humanos. Estos conjuntos de datos serian aplicados para evaluar el riesgo de las varias actividades del desarrollo de una mina en un a priora modo para planear medidas preventivas y la mitigación que reducirá impactos del medio ambiente en una manera costo-efectivo.

M.C. Reiley, U.S. EPA

For decisions and actions to serve us well in any venue we must be able to reopen debate, reanalyze data, incorporate new insights, and reveal new truths. That is, we must be able to untie and retie the ends of our decisions and understanding and propose new knots and combinations. We must be able to unscrew the planks of our positions, add new ones, and reorder their assembly to come to new or stronger conclusions. If we choose to nail the planks into place, that is be parochial or stubborn about how much we really know and the usefulness of new information, then we turn a simple disassembly into demolition and make it much more difficult to refurbish and reuse the pieces. This talk will bring my personal perspective on the process of science-based decision making, what has enabled it over the last 30+ years, the multi-discipline collaboration that is fundamental to its success, and the its application to the environmental challenges we face now and in the future. Disclaimer: The contents, proposals, and perspectives in this presentation are mine and do not represent the views or positions of the US Environmental Protection Agency.

OT3. Pharmaceuticals and the Environment: Fish on Prozac and other Harbingers of an Urbanizing Water Cycle
B.W. Brooks, Baylor University / Environmental Health Science Program Department of Environmental Science

More people now live in cities than ever before. Historically, human populations thrived near rivers and their mouths at coastlines, but with urban expansion the footprints of metropolitan areas extend throughout watersheds and ultimately encompass smaller order tributaries. Such population densities dictate the need for new water supplies and reclamation infrastructure, which results in effluent discharges to these headwater streams, dramatically modifying instream hydrology, particularly in regions where ephemeral streams are normative. When effluent-dominated and dependent instream flows become critical arteries for beneficial water reuse, as increasingly is observed in areas experiencing climate changes and rapid population growth, an urban water cycle is realized. A decade has now passed since our research group initially reported several adverse effects of Prozac (fluoxetine) to aquatic organisms commonly employed for developing environmental quality criteria, evaluating whole effluent toxicity, and monitoring ambient toxicity of surface waters and sediments. Our subsequent observation of fluoxetine, sertraline (Zoloft) and their active metabolites (norfluoxetine and desmethylsertraline, respectively) accumulating in muscle, liver and brain tissues of three different fish species from an effluent-dominated stream was termed “Fish on Prozac.” Here I briefly review some scientific lessons learned from our study of urbanizing aquatic systems. Using probabilistic hazard assessment and fish plasma modeling approaches, selective serotonin reuptake inhibitors and tricyclic antidepressants are predicted to result in therapeutic hazard to fish (internal fish plasma level equal mammalian therapeutic dose) when exposed to water (inhalational) at or below 1 µg/L, a common trigger value for initiating environmental assessments. Though many questions remain unanswered, studies of pharmaceuticals in urbanizing aquatic systems have provided, and will continue to develop, an advanced understanding of environmental hazards and risks associated with other contaminants and future water quality challenges.
Plataforma Abstracts

Tuesday

Use of Pesticides and Their Impacts on Native Species: The Situation in Latin America.

PT1. Linking cypermethrin and chlorpyrifos residues with toxicological effects on native fish Jenynsia multidentata: a laboratory study

R. Bonavrea. Universidad Nacional de Cordoba / Facultad de Ciencias Químicas CIBIC; D.A. Wanderlin, Universidad Nacional de Cordoba / ICTYAC

The extensive use of the insecticides Cypermethrin (CYP) and Chlorpyrifos (CPF) in Argentina for agriculture and domestic purposes resulted in the presence of these pesticides in local rivers and the exposure of non-target organisms. Moreover, CYP and CPF residues were detected in different organs of the native fish Jenynsia multidentata exposed to these pesticides singly as well as in technical and commercial mixtures under laboratory conditions. The aim of the present study was to evaluate the toxic effects of CYP and CPF using biochemical and behavioral biomarkers when the J. multidentata was exposed to the same chemical stress. Moreover, we explore the linkage between the responses of biomarkers and the pesticides residues measured in fish tissues. Thus, adult female fishes were exposed over 96 h to 0.04µg/L CYP; 0.4µg/L CPF; 0.04µg/L CYP + 0.4µg/L CPF in a technical mixture; and 0.04µg/L CYP + 0.4µg/L CPF in a mixture of commercial products. Forty five variables were measured in different fish organs (biotransformation, antioxidant and, cholinesterase enzymes activities; P-glycoprotein and aromatase expression; oxidative damage in lipids and proteins) as well as several swimming behavior parameters. Then, explorative multivariate analysis identified differences among treatments according to the biomarkers response. Linear discriminant analysis was further applied to identify 1 or 2 biomarkers per organ that better explain the variability among treatments. Those selected biomarkers responses were included in an Integrated Biomarker Response index (IBR) which allowed to arrange the treatments according to an increase in the effect on J. multidentata: Control < CYP 0.04µg/L < CPF 0.4µg/L < 0.04µg/L CYP + 0.4µg/L CPF in a technical mixture < 0.04µg/L CYP + 0.4µg/L CPF in a mixture of commercial products.

Finally, a Spearman correlation analysis was performed between the IBR and the CYP and CPF concentrations estimated in total fish tissue. A significant correlation (r= 0.999, p<0.05) was obtained between IBR and total pesticide concentration. This result indicates that the higher accumulation of the two insecticides, the greater the effect of toxicity found in J. multidentata. Even when positive correlations were found between IBR and residues of CYP or CPF, they were not statistically significant (CYP: r= 0.82, p= 0.09; CPF: r= 0.67, p= 0.2), thus we cannot attribute the effects to the bioaccumulation of only one pesticide.

PT2. Sublethal effects of current-use pesticides in aquatic macrophytes

M. Menone, Universidad Nacional Mar del Plata / Lab de Ecotoxicología Departamento de Ciencias Marinas; D. Perez, INTA / Agronomy; G. Lukaszewicz, Universidad Nacional Mar del Plata / Instituto de Investigaciones Marinas y Costeras; D.S. Gurancini, IMyCy CONICET-UNMdP / Lab de Ecotoxicología Departamento de Ciencias Marinas; M.V. Amé, Universidad Nacional de Córdoba- CONICET / Bioquímica Clínica

Despite the importance of algae and aquatic macrophytes at the base of the aquatic food webs, they are not commonly included in ecotoxicology research. Aquatic macrophytes convert solar energy and carbon dioxide into organic matter, produce oxygen, and provide habitat, food and oviposition sites for other organisms among other ecosystem services. Because of that, they must be protected from adverse agrochemical effects in order to maintain ecosystem functions and structure. Traditionally, persistent organic pesticides have been monitored, but current-use hydrophilic compounds have gained popularity and should be taken into account because they can induce acute and chronic effects in non-target organisms. The main objective of our work is to detect early stages of pollution by current-use pesticides in freshwater ecosystems using biomarkers in native aquatic species. We emphasize on fungicides and hydrophilic and genetic biomarkers in the aquatic macrophytes Bidentis laevis and Myriophyllum quinense. Some fungicides have been detected in surface waters at concentrations higher than regulatory limit and it can be assumed that their massive use poses a risk for the environment. However, data of its effects are still scarce in the literature. Azoxystrobin (AZX) belongs to a new class of widely-sold systemic fungicides. It has a low water-octanol partition coefficient (log Kow= 2.5), and its mode of action is the inhibition of mitochondrial respiration in fungi. In plants AZX is genotoxic, showing aneuincogenic and clastogenic effects in B. laevis and M. quinense, respectively. Recent results show that it also causes oxidative stress, changes in certain enzymes associated with the carbon fixation as well as in physiological parameters, in sublethal and acute treatments. These sublethal effects might ultimately reduce the fitness or drive to adaptation to contaminated environments.

PT3. Efectos de plaguicidas sobre organismos del plancton y procesos de remediación.


A partir de lo presentado en el Simposio SETAC 2006: “Efectos de la contaminación acuática sobre el zooplancton y el zoobentos en estudios de laboratorio y de campo: La experiencia de una década: 1996-2006”, nos preguntan: ¿En qué avanzamos luego de dos décadas? ¿Qué desafíos se plantearán en el futuro en un país en desarrollo como Argentina?. En este simposio 2015 haremos foco en los efectos de plaguicidas: glifosato, atrazina, endosulfan y 2,4-D sobre especies del plancton estandarizadas y nativas a diferentes escalas de estudio y niveles biológicos. Entre los principales avances logrados, se destaca la determinación de biomarcadores tempranos y sensibles de daño ambiental: alteraciones del comportamiento (cambios en el patrón normal de la migración vertical diurna, de agrupamiento, actividad natatoria alterada, inhibición de la evasión ante la depredación y desorientación); alteraciones en atributos de historia de vida (talla, fecundidad, sobrevivencia, edad de primera reproducción, r, longevidad, Ro y tiempo generacional. En arroyos del centro-este de Argentina se monitoreó glifosato, ácido amoníaco fóssil (AMPA), Atrazina, 2,4-D y Endosulfan y sus efectos sobre el zooplancton. El glifosato se asocia a la fracción particulada y se deposita en los sedimentos en el orden: Material particulado>Sedimento>Agua superficial. Se comprobó contaminación difusa y se propone la reevaluación de la inocuidad del glifosato, de los actuales niveles guía y de las prácticas agrícolas instaladas. Se evaluó un proceso de remediación de agua con glifosato (UV/H2O2 con plancton). Se realizaron experiencias de remediación de atrazina, glifosato y endosulfan siendo C. vulgaris más eficiente para remover endosulfan que los dos herbicidas. Se destaca la relevancia del monitoreo permanente y determinación de efectos en especies no bío-blancos. Estos resultados se extendieron a instituciones gubernamentales, educativas y ONGs participando médicos, científicos, ecotoxicólogos, autoridades ambientales, municipales, comunales, alumnos y docentes de escuelas rurales. Se proponen medidas de gestión ambiental a distintas escalas orientadas a diferentes actores sociales.

PT4. Physiological parameters in the fish Prochilodus lineatus after acute and sub-chronic in situ exposures in one agricultural area in southern Brazil

C. Delfino Vieira, T.P. GOUVEIA, Universidade Estadual de Londrina; P. Meleti, C.B. Martinez, Universidade Estadual de Londrina / Ciencias Fisiológicas

This work aimed to investigate physiological biomarkers, such as metabolic parameters, neurotransmission and swimming resistance in the Neotropical fish Prochilodus lineatus submitted to acute and sub-chronic in situ tests in an area that receives inputs of pesticides in northern Paraná, southern Brazil. Juveniles of P. lineatus were supplied by the fish farming station of the State University of Londrina (EPUEL) for the in situ tests, in which fish (n=500) were confined in a large cage (6000 L). The tests were performed simultaneously at two sites: EPUEL (CTR) and a lake in an agricultural area (EXP). During the in situ tests, fish remained in contact with the sediment in order to allow free access to the substrate. Animals received food supplementation through commercial feed three times a week. After four periods of caging (5, 15, 30 and 60 days) a number of fish was sacrificed and immediately transported to the laboratory. At the laboratory one group of fish (n = 15) was subjected to a natatory resistance test (NR), in which animals were placed in a water tunnel and forced to swim countercurrent, initially at a slow flow rate (10 L min-1) which was gradually increased by 5 L min-1 at every minute, until fish could no longer resist the flow. Fish from the other group were sampled and the following parameters were determined: glucose and lactate content in plasma, liver and muscle
glicogen concentration and the activity of acetylcholinesterase (ACHE) muscle and brain. In comparison to the CTR groups, fish caged at the agricultural area showed a decreased activity of ACHE in the brain (18%) after 15 days and in the muscle after 5 (38%) and 30 (30%) days exposure. The same animals showed an increase in liver glycogen levels at all experimental times (170, 70, 207 and 154% respectively), while in the muscle glycogen increased by 23% only after 60 days of exposure. We also observed in the EXP group an increase of 50, 13 and 30% in glucose after 5, 15 and 30 days, respectively, as well as a greater NR at all experimental periods (98, 45, 55 and 42%), which can be related to a hyperactivity promoted by the inhibition of ACHE. These results suggest that fish caged in the rural area presented an energetic mobilization mechanism from glucose and glycogen storage in the liver, possibly due to increased metabolic demand for detoxification and/or compensation to a chronic stress situation.

**PT5. Toxicidad oral aguda del insecticida neonicotinoide imidacloprid en palomas medianas (Zenaida auriculata)**

L. Addy Orduña, Instituto Nacional de Tecnología Agropecuaria / Grupo Biodiversidad; J. Brodeur, CONICET

Los neonicotinoides son un grupo de insecticidas que están siendo cuestionados por sus impactos negativos directos e indirectos sobre un amplio rango de especies no blanco, entre ellas, las aves. Para aportar más información de base que contribuya a mejorar las estimaciones de riesgo de los neonicotinoides para las especies de aves, determinó la toxicidad aguda (dosis letal 50, DL50) de una formulación insecticida neonicotinoide (IMIDA® NOVA 60, 60%v/v de imidacloprid) en palomas medianas (Zenaida auriculata). El insecticida fue administrado por vía oral según el procedimiento estandarizado en etapas secuenciales recomendado por la Organización para la Cooperación y el Desarrollo Económico (OECD Test Guideline 223). La DL50 obtenida fue (59 ± 22) mg i.a./Kg. Los síntomas agudos consistieron en pérdida de coordinación y de equilibrio en el desplazamiento o inmovilidad completa. El inicio de los síntomas varió entre 5 y 165 minutos. No hubo una clara relación entre el tiempo de muerte (periodo desde la dosificación hasta la muerte del ave) y la dosis de imidacloprid administrada, variando este periodo entre 105 y 480 minutos. El tiempo de recuperación (periodo desde la dosificación hasta la ausencia de síntomas de intoxicación) varió entre 4,5 y 51 horas en las sobrevivientes dosificadas. Todas las aves dosificadas redujeron significativamente el consumo de alimento durante los tres días posteriores al aporte. Como consecuencia, hubo una reducción significativa del peso corporal entre las palomas dosificadas y las palomas controles, principalmente entre los días 1 y 3 posteros a la dosificación. En conclusión, los efectos tóxicos agudos observados permiten clasificar a este insecticida neonicotinoide como altamente tóxico (DL50< 100 mg i.a./Kg) para esta especie de ave silvestre.

**PT6. Cytogenetic effect of herbicide formulation Roundup® on cultivated armadillo’s peripheral lymphocytes**

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The large hairy armadillo (Chaetophractus villosus) reaches high population densities in natural and cultivated grassland in Argentina. Herbicide containing isopropyl amine salt of glyphosate (GLY) used in cultures is considered by some species of birds as an important food source. Nevertheless, possible effects of this pesticide on the immune response have not been studied yet in this species. The aim of this work is to study the genotoxic effect of an important factor in the pesticide compound is complex interactions with different groups of chemicals, because the bees foraging in areas contaminated with one or both molecules. Thus, fipronil and imidacloprid may act isolated or combined. An important factor in the pesticide compound is complex interactions that may occur, and the toxicity of various substances depends also on exposure time. Thus, this study aimed to determine the mean lethal time of fipronil and imidacloprid alone and in combination, when M. scutellaris are exposed to LD50 and LC50, as well as their respective sublethal doses and concentrations (LD50/10, LD50/100, LC50/10, LC50/100). For this, tests were performed according to OECD’s protocol (1998). The results indicate that imidacloprid is able to kill stingless bees contaminated more rapidly than fipronil, and the neonicotinoid is less toxic than fipronil. This could be due to rapid metabolism of imidacloprid in 5-hidroxicimaclopridó y olefin substances which high toxicity to insects. Because of fipronil be slower to kill bees, if contaminated, these insects return the colony carrying the insecticide and improving the contamination. However, rapid mortality caused by imidacloprid cannot cause the bee to return to the colony and avoid to contaminate other bees. However, there is a decrease in the number of forage bee, and could to endanger the functioning of the colony and pollination. It was also observed that the LT50 of the combination of pesticides, both in contamination topically as orally, showed intermediate values between the LT50 of the isolated compounds. Thus, the combination of fipronil and imidacloprid insecticides showed no synergistic effect for bees M. scutellaris.

**PT7. LT50 of fipronil and imidacloprid alone and in combination to Melipona scutellaris Latreille (Hymenoptera: Apidae)**

L.M. Costa, T.C. Grella, Programa de Pós Graduação em Agricultura e Ambiente; R.A. Barbosa, UNESP Rio Claro / Departamento De Biologia; O. Malaspina, UNESP Universidade Estadual Paulista Júlio de Mesquita Filho / Departamento de Biologia Centro de estudios de insetos sociales; R.C. Nocelli, Ciencias Biológicas / Departamento de Ciencias de la Naturaleza Matemática y Educación

The bee population is decreasing and the pesticides, including fipronil and imidacloprid, have been indicated as the main substances involved in colony collapses in Brazil, the bees are affected by the effects of exposure to these substances, and these species, such as Melipona scutellaris, are more sensitive to insecticides that Apis mellifera. The fipronil and imidacloprid act on the insect central nervous system, but in different ways, inducing neuronal hyper-excitation and death. In some cases, the bees are susceptible to exposure to different groups of chemicals, because the bees foraging in areas contaminated with one or both molecules. Thus, fipronil and imidacloprid may act isolated or combined. An important factor in the pesticide compound is complex interactions that may occur, and the toxicity of various substances depends also on exposure time. Thus, this study aimed to determine the mean lethal time of fipronil and imidacloprid alone and in combination, when M. scutellaris are exposed to LD50 and LC50, as well as their respective sublethal doses and concentrations (LD50/10, LD50/100, LC50/10, LC50/100). For this, tests were performed according to OECD’s protocol (1998). The results indicate that imidacloprid is able to kill stingless bees contaminated more rapidly than fipronil, and the neonicotinoid is less toxic than fipronil. This could be due to rapid metabolism of imidacloprid in 5-hidroxicimaclopridó and olefin substances which high toxicity to insects. Because of fipronil be slower to kill bees, if contaminated, these insects return the colony carrying the insecticide and improving the contamination. However, rapid mortality caused by imidacloprid cannot cause the bee to return to the colony and avoid to contaminate other bees. However, there is a decrease in the number of forage bee, and could to endanger the functioning of the colony and pollination. It was also observed that the LT50 of the combination of pesticides, both in contamination topically as orally, showed intermediate values between the LT50 of the isolated compounds. Thus, the combination of fipronil and imidacloprid insecticides showed no synergistic effect for bees M. scutellaris.

**PT8. Effects of azinphos-methyl on cellular immune responses of the freshwater snail Chilina gibbosa.**

J.M. Castro, INIBIOMA CONICET - CEA / Laboratorio de Ecotoxicología Acuática DINITIOMA; V. Bianchi, Universidad Nacional del Comahue; L.T. Herbert, IQUIBICEN CONICET-Universidad de Buenos Aires / IQUIBICEN; A. Venturini, Universidad Nacional del Comahue / LBIQUIDMA; G. Kristoff, UBA-CONICET / Departamento de Química Biológica IQUIBICEN; C.M. Luquet, CONICET / Laboratorio de Aquatic Ecotoxicology INIBIOMA

Agriculture is one of the main economical activities in Upper Valley of Río Negro and Río Neuquén in Argentina. The use of pesticides released during these activities may negatively affect physiological responses of non-target exposed organisms. A recent study has shown cholinesterase activity inhibition and neurotoxic effects upon azinphos-methyl (AZM) exposure in Chilina gibbosa. Nevertheless, possible effects of this pesticide on the immune response have not been been observed in the number of forage bee, and could to endanger the functioning of the colony and pollination. It was also observed that the LT50 of the combination of pesticides, both in contamination topically as orally, showed intermediate values between the LT50 of the isolated compounds. Thus, the combination of fipronil and imidacloprid insecticides showed no synergistic effect for bees M. scutellaris.
independent treatment). Data were compared by one-way ANOVA and post hoc comparisons. Results: Total hemocyte number showed no variation between treatments. Cellular viability significantly decreased upon solvent exposure, but this effect was greater when snails were exposed to AZM. Relative proportions of haemocytes and round cells showed no variation between treatments; however, round cells were significantly more abundant than haemocytes, in general. Granulocytes were not observed in any sample. Phagocytosis was mainly carried out by haemocytes and was not affected by exposure to the solvent, but was significantly inhibited by AZM, related to the control. Conclusion: Short-term exposure to AZM negatively affects cell viability and phagocytic activity in haemocytes of C. gibosa, producing no changes in the cellular type proportion.

Soil Ecotoxicology in Latin America: Where to go?

PT9. The state of art of soil ecotoxicology in Latin America
F.M. Rodrigues da Silva Júnior, Laboratory of Pharmacological and Toxicological As / Instituto de Ciências Biológicas ICB

Although more recent that the aquatic ecotoxicity studies, studies involving the ecotoxicological approach in terrestrial compartment has gained emphasis in Latin America. The vast majority of studies have the soil organisms of relevance for maintenance of ecosystem processes such as nutrient cycling and energy flow along the food chain. Earthworms and springtails are among the organisms more used in the studies well as the soil microbiota. More recently, it has been encouraged the use of biomarkers for detailed investigation of toxicity mechanisms in soil organisms and also studies using ecological models more realistic. The major challenge in Latin America is the spread of soil ecotoxicology in countries with less tradition in ecotoxicology studies.

PT10. Ensaios de ecotoxicidade terrestres padronizados: aplicações às questões ambientais
J. Niemeyer, Rua Prof. Sabino Silva / Campus de Curitibanos

Os ensaios de ecotoxicidade consistem expor organismos-teste a uma matriz ambiental para avaliar seus efeitos sobre a biota. Eles podem ajudar a determinar se a concentração de um contaminante ou mistura de contaminantes é suficiente para causar efeitos tóxicos sob a sobrevivência, crescimento, reprodução, comportamento ou outros aspectos da biota. Diversos ensaios de ecotoxicidade com organismos terrestres já possuem protocolos padronizados por entidades como ISO (International Standardization Organization), OECD (Organisation for Economic Co-operation and Development) e ABNT (Associação Brasileira de Normas Técnicas). O objetivo deste trabalho é apresentar os protocolos disponíveis para ensaios de ecotoxicidade com solo, suas aplicações, vantagens e limitações para a gestão de áreas contaminadas, disposição de resíduos, biomonitoramento e avaliação de risco ecológico. O principal enfoque será dado aos protocolos já padronizados pela ABNT, e serão apresentados exemplos da sua aplicação em estudos de caso na América Latina. Serão discutidas as perspectivas futuras no cenário da América Latina.

PT11. Integrated ecological risk assessment of pesticides in tropical ecosystems
M.T. Nance, V.B. Menezes-Oliveira, M. Bianchi, B. Vieira, Escola de Engenharia de São Carlos / USP / Hidráulica e Saneamento; E. Espindola, University / Hydraulics and Sanitation

Knowledge on pesticide impact in the tropics is slightly compared to what is known about its impact in temperate systems. Risk assessment strategies in the tropical areas rely mostly on the extrapolation of data from temperate regions. Since 2008 Brazil has become the world’s pesticide top consumer. However, the current national procedure for plant protection products (PPP) registration focus mainly on analysing substances for hazard assessment and there is a strong need to move forward in the inclusion of risk assessment procedures. On this basis, NEEA/EESC/USP team aims to contribute to an ecologically relevant assessment of the ecotoxicological effects of pesticide applications at agricultural areas in the tropics, using an integrated approach with information gathered from soil and aquatic compartments. Data for risk assessment is being generated by the NEEA team through studies developed in agricultural fields at Bom Repouso city, Minas Gerais, Brazil. Bom Repouso fields are mostly cultivated using a sort of pesticides and has been the target of the NEEA team for several years. This presentation contemplates some of the studies developed by the NEEA team. The developed studies aimed to assess the pesticide effects (isolated and in combination) to the following aspects: ecosystem functioning and structure; calibration and validation of the models developed for the USA and EU scenarios for the tropical situations; prediction of the pesticide concentrations in the aquatic and terrestrial ecosystems; assessment of the pesticide effects in trophic chains; contribution to the comprehension of the ecological effects; extrapolation of the risk assessment data from temperate to tropical regions (Brazil); assessment of the habitat and retention functions of tropical soils after spiking them; development of the tools that are cost-effective and readily amenable to standardization for performing laboratory simulations of pesticide spraying, leaching, and surface runoff; and the assessment of these tools by comparing field and laboratory results. These studies are being used as basis for the development of several research projects involving pesticides and its effects to terrestrial and aquatic systems, besides human health, leading to a very relevant database for the application of the Ecological Risk Assessment and new experimental designs.

PT12. Ecotoxicidade em áreas de recuperação da mineradora de Candido - RS
A. Campos, Universidade Federal do Rio Grande - FURG; F. Marin; A.J. Maraschielo, Terrestrial Ecotoxicology; L. Couelle; F.M. Rodrigues da Silva Júnior, Laboratory of Pharmacological and Toxicological As / Instituto de Ciências Biológicas ICB

Bioensaios de ecotoxicidade têm sido utilizados em avaliação preliminar no gerenciamento de áreas degradadas ou em processo de recuperação. Dentre as atividades prioritárias potencialmente poluidoras estão as áreas de exploração do carvão mineral. No passado, asáreas de mineração não tinham quaisquer medidas de recuperação, as quais se configuram como áreas de passivo ambiental, requerendo alternativas para recuperação destas áreas. O objetivo deste estudo foi investigar, de maneira preliminar, a qualidade de um solo construído em uma estação experimental de recuperação de passivo ambiental em área de mineração. Foram utilizados bioensaios de germinação com alfáce (Lactuca sativa) e feijão (Phaseolus vulgaris) e teste de fugacidade com o isópodo terrestre Armadillidium vulgare e a micromaculaisianaisaemando com três amostras de solos: controle (livre de contaminação ecolocado a 10 km da área de mineração), área de passivo ambiental (sem recuperação) e área recuperação experimental (solo argilo). Os bioensaios de fitotoxicidade com duas espécies demonstraram que o solo argilo foi o melhor substrato para germinação, enquanto que este mesmo solo não exibiu toxicidade quando utilizado nos ensaios de fugacidade com osso invertebrados terrestres. Os resultados dos bioensaios de fitotoxicidade e fugacidade mostraram que a utilização do solo argilo no processo de recuperação ambiental parece ser uma estratégia promissora em áreas de mineração.

PT13. Ecotoxicological assessment of a dredged sediment using bioassays with three species of soil invertebrates
R. Cesar, Department of Geography; T. Natal da Luz, University of Coimbra / Department of Life Sciences; E. Bidone, Fluminense Federal University / Dept of Geology; Z. Castro, Centre for Mineral Technology; H. Polivanov, Federal University of Rio de Janeiro / Geology; J.F. Sousa, CFE / Centre for Functional Ecology / Dept Life Sciences of University de Coimbra

The ecotoxicity of a dredged sediment from the Guanabara Bay (Rio de Janeiro, RJ, Brazil) was evaluated using reproduction tests with Eisenia andrei, Folsomia candida and Enchytraeus crypticus, and avoidance and feeding inhibition tests with Folsomia candida. The sediment was mixed with artificial soil to obtain the following doses: 1.25, 2.5, 5.0, 10.0, 20.0 and 40.0%. Lead, nickel, chromium, copper and zinc concentrations were determined in the test mixtures. In reproduction tests, E. andrei was the most sensitive species (EC50 = 2.94%), followed by F. candida (EC50 = 7.72%) and E. crypticus (EC50 = 10.10%). The percentage of initial weight of earthworms was significantly higher in all test concentrations compared to the control except at the highest one where earthworm biomass significantly decreased. No feeding inhibition of F. candida was observed for any test mixture and the number of organisms with a dark gut (the fed collombolans) generally increased with the increasing dose of sediment. Significant avoidance responses of F. candida were observed towards all test mixtures, however, the avoidance behaviour was the less sensitive endpoint after feeding inhibition. The reproduction test is not sufficient to foresee toxic effects in terrestrial systems resulting from sediment disposal in soil if not complemented with an ecotoxicological evaluation.

PT14. Can agricultural application constitute an alternative to the landfill disposal of wastes?

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PT15. Microcosmo: efectos de Glifosato y Clorpirifos sobre organismos no blanco
J. Amand de Mendieta, National University Mar del Plata; C. Salicio, National University of Mar del Plata; A. Lopez, P. Manetti, National University Mar del Plata
El microcosmo es una herramienta óptima para evaluar los efectos combinados de los plaguicidas en la estructura funcional del ecosistema suelo. Se evaluaron los efectos individuales y en mezclas de Glifosato y Clorpirifos sobre Octolasion cyaname (Annelida: Oligochaeta, Lumbricidae), Porcellio scaber (Crustacea: Isopoda) y Brassica napus (Brassicales: Cruciferae). La unidad experimental (UE) consistió en un recipiente de PVC (12 cm de diámetro y 40 cm de altura) donde se colocaron 3 kg de suelo y sobre la superficie 4,7 g de rastrojo de trigo. En cada UE se introdujeron 10 individuos adultos ciliados de O. cyaname (300-600 mg), 8 individuos de P. scaber (40-60 mg) y se sembraron 10 semillas de B. rapa. Se utilizaron Glifosato (concentrado soluble, 48% de ingrediente activo (i.a.)) y Clorpirifos (concentrado emulsifial, 88% de i.a.). Los tratamientos fueron: 960, 4800 y 9600 g de Glifosato ha-1, 576, 2880 y 5760 g de Clorpirifos ha-1 y sus combinaciones y se aplicaron sobre el suelo mediante un pulverizador manual. El diseño fue completamente aleatorizado con 6 repeticiones y los recipientes se colocaron en una cámara a 20±2°C y 14L:10H. A los 28 días después de la aplicación (DDA), el número de O. cyaname vivas no difirió entre los tratamientos (p>0,307). El peso final (PF) de O. cyaname a los 28 DDA mostró diferencias entre los tratamientos (p=0,034), observándose que el PF fue menor con 576 g de Clorpirifos y con 4800 g de Glifosato+2880 g Clorpirifos. Se encontraron diferencias en el porcentaje de P. scaber muertos a los 5, 7 y 28 DDA (p<0,05), obteniéndose el mayor con Clorpirifos solo o en mezcla. Con Glifosato el porcentaje de muertes no difirió en relación al testigo (p>0,05). El porcentaje de emergencia (PE) en B. rapa difirió entre los tratamientos a los 16 días después de la siembra (DDS) (p<0,01), detectándose con Clorpirifos, solo o en combinación, una emergencia superior a 85% (p<0,05). El porcentaje de plantas totales (PPT) varió entre los tratamientos a los 28 DDS (p<0,001), diferenciándose todos los tratamientos del testigo con 4800 y 9600 g de Glifosato. Clorpirifos, solo o con Glifosato, causó disminución en el peso de O. cyaname como letalidad sobre P. scaber y en B. rapa ocasionó aumento en su PE como PPT.

PT16. Fitotoxicidade de contaminantes químicos e amostras ambientais: enfase em produtos de higiene pessoal

Productos de higiene pessoal são utilizados o tempo todo pela maioria das pessoas; dentre eles pode-se citar os antissépticos bucais no qual o seu uso diário promete evitar diversos problemas tais como cáries, formação de placa bacteriana, mau hálito, gengivite entre outros. No entanto, esses produtos possuem diversos princípios ativos como por exemplo: fluoretos, peróxido de hidrogénio, gluconato de cloreodrina. O descarte indevido dos resíduos gerados e das embalagens dos antissépticos também podem causar danos ao ambiente, em função do aumento destas substâncias nos efluentes domésticos, alterando a qualidade das águas onde o mesmo é lançado. Objetivo deste estudo foi avaliar a toxicidade de diferentes tipos de enxaguantes bucais em concentrações distintas utilizando ensaios de toxicidade aguda em sementes de alfafa (L. sativa). As sementes de alfafa foram expostas em placas de Petri (n = 25 sementes por placa), com concentrações diferentes de enxaguantes bucais, diluídos em água mineral. Foram testados quatro tipo de enxaguantes (A, B, C, D) nas devidas concentrações (0% 1%, 3%, 10%, 50%, 75% e 100%). As placas de Petri foram mantidas por cinco dias na incubadora a 25°C. Após dos cinco dias foi analisado e germinação das plântulas, peso fresco e peso seco. No teste de toxicidade aguda em sementes de alfafa (L. sativa) a toxicidade dos enxaguantes bucais (A, B, C, D) demonstrou toxicidade variável, sendo que o produto A e B obtiveram maior toxicidade não apresentando nenhuma germinação nas concentrações testadas. Já o produto C apresentou germinação nas concentrações 1, 2, e 3% e o produto D no 1, 2, e 3% sendo considerados de menor toxicidade. Com análise do peso fresco e peso seco pode-se constatar uma diminuição de ambos comparado com o controle negativo. Os diferentes tipos de enxaguantes bucais testados demonstraram toxicidade para a hortaliça L. sativa. Está toxicidade pode estar relacionada ao tipo de princípio ativo de cada produto.

Urban and Agricultural areas: An Ecotoxicological Paradigm in Modern Society

PT17. Urban and Agricultural areas: An Ecotoxicological Paradigm in Modern Society
F. Abdalla, USFCar / Biology; F. Campos-Pereira, Unesp - Institute of Biology / Biology; R. Hara, Biology; P. Balusam, E. Siva-Zucarín, Universidade Federal de São Carlos - USFCar - Sorocaba / Biology
We will present data of growing world population throughout history associated to the deforestation worldwide and increased xenobiotic use. Data on the creation of cities and urban expansion. How the cities have been impacted the environment, concerning the releasing of organic material (cemeteries, legal and illegal landfills, municipal wastes etc), such as cadaverine and putrescine.

PT18. Biological assays show the potential environmental contamination of the necrochorme
F. Campos-Pereira, M. Marin-Morales, Unesp - Institute of Biology / Biology

Human activity is degrading the environment through different aggressors and has compromised the quality of surface and groundwater. Recent studies show that substances in necrochorme such as putrescine and cadaverine, can offer risks to human health, but the literature on the environmental toxicity of these substances is very scarce, almost nonexistent. This situation motivated our research group to conduct a series of biological assays in different organisms test. Our work aims to investigate the mechanisms of action of these substances and determine their potential as environmental pollutants. Our results might provide important data guiding possible occupational laws for individuals exposed to these contaminants.

PT19. Cemeteries: potential sources of environmental impacts
R. Hara, Biology; F. Campos-Pereira, M. Marin-Morales, Unesp - Institute of Biology / Biology
Population growth has contributed to the increase of the environmental contamination. One of the major environmental changes to be considered is
related to contaminations in areas of cemeteries, due to the high burial index of human bodies. Decomposition of bodies produces a liquid called necroslurry, which consists of organic and inorganic substances and, eventually in pathogenic microorganisms. Among the organic substances present in this liquid is the cadaverine (C6H13N2), a toxic substance, which enters in contact with the environment by percolation of the necroslurry into the soil, and can reach surface waterbodies, highlighting the importance of this study to estimate the frequency of chromosomal aberrations and micronuclei induced by the exposure of Allium cepa seeds to different concentrations of cadaverine (553.5 mg/L; 430.50 mg/L; 307.50 mg/L; 184.5 mg/L and 61.5 mg/L). The negative control was performed exposing the seed to ultra-pure water and, the positive control, to methyl methane sulfonate (MMS – 4x10^-4). The Allium cepa seeds were germinated in Petri dishes directly into the cadaverine concentrations, ultra-pure water and MMS, until they reach 1.5 cm in length. The roots were collected, fixed, hydrolyzed and stained with Schiff’s reactive. Slides were prepared by soft crushing of the meristematic region and counterstained with carmin-acetic acid (2%). 5000 cells/treatment were analyzed and the data were compared with the negative control. The mitotic index was evaluated by the ANOVA/Dunnett’s statistical test (p < 0.05) and the chromosomal aberrations (CA/micronucleus) by the Kruskal-Wallis test (p < 0.05). For the analysis of the results, it could be observed that cadaverine showed an increase of the mitotic index in the concentration of 184.5-mg/L. Moreover, it was observed a significant increase on the frequency of CA, indicating a genotoxic activity. The other concentration did not induce genotoxic changes in the test organism Allium cepa. By these results, we emphasize the importance of studies with this biogenic amine, to evaluate the damages that can be promoted on the organisms eventually exposed to such substances.

PT20. Effect of urbanization and population growth on bees

E. Siva-Zacar, P. Balsamo, C. Domingues, Universidade Federal do São Carlos /UFSCar/ Sorocaba /Biology; M.J. Costa, Universidade Federal de São Carlos /UFSCar/ Sorocaba / Department of Biology; F. Abdalla, UFSCar / Biology

Bees are pollinator insects that play an important functional role in most terrestrial ecosystems, but habitat fragmentation and loss of natural habitats because of agricultural intensification and urbanization are threatening many bee populations. As most natural landscapes around the world have been anthropogenically modified, it is likely that pollinator abundance and richness has declined in many parts of the world. We evaluated the communities of bees in three fragments located in Sorocaba city, São Paulo State/ Brazil, as follow: (A) fragment surrounding a conventional crop; (B) fragment associated with an anthropic field; (C) fragment in an urban area. The present study evidenced that the decrease of bee’s abundance in urban areas is intimately related to the diversity, highlighting the importance of monitoring of bees in areas altered by human activities to evaluate the risk of habitat fragmentation for conservation of Brazilian native bees. In addition, we performed toxicological bioassays with Scaptotrigona postica in order to evaluate the side-effects induce by boric acid, a pesticide for domestic use in cities for urban pest control, in the Malpighi tubules (excretory organ) of this stingless bee species. The data indicated characteristics that are indicative of indication of cell death in some excretory cells, although the most of cells remained metabolically active in the processes of excretion. This study detected cellular responses that indicated toxicity and adaptive mechanisms to stress induced by exposure of bees, which are foraging in the vicinity of cultivated fields and/or in green urban areas, to low doses of chemical compounds present in the environment. The compilation of our data, obtained from field and laboratory conditions, indicated different levels of the urbanization effects on bees’ populations that can be affected by both xenobiotics and fragmentation of their habitats.

PT21. Evaluation of the cytotoxicity, genotoxicity and mutagenicity of sewage sludge using Allium cepa bioassay

M.C. Martins, V.V. Souza, Universidade Federal do Espírito Santo; Td. Souza, Universidade Federal do Espírito Santo / Biology

In many countries, sewage sludge has been widely used as organic fertilizer in agricultural soils. This study aimed to analyze the potential cytotoxic, genotoxic and mutagenic of sewage sludge from two sewage treatment plants (STPs) using Allium cepa bioassay. Allium cepa seeds were exposed to treatments (raw sludge and solubilized sludge from STPs JM and M, treated sludge raw and treated sludge solubilized from STP M). Distilled water and organic substrate were used as negative controls and trifuralin herbicide was used as positive control. Roots were collected and fixed in Carnoy I and hydrolyzed in 1N HCl at room temperature for 20 minutes. Tips of the roots were cut in blade and stained with acetic orcein 2%, covered with cover slip and macerated. The material was analyzed in light microscope with magnification of 400 x. Five thousand cells per treatment were analyzed. The cytotoxic potential was assessed by calculating the mitotic index (MI). The genotoxic potential was assessed by counting mitotic and chromosomal abnormalities. The mutagenic potential was determined by the presence of micronuclei and chromosome breakage in meristematic cells and micronuclei in F1 region of cells. Statistical analysis was performed using the non-parametric Kruskal-Wallis (p < 0.05). The results showed that the raw sludge JM inhibited the germination of seeds of A. cepa, while the solubilized sewage sludge was cytotoxic and genotoxic. No treatment was mutagenic. Considering the M sludge, solubilized treatment has been cytotoxic and raw sewage sludge was genotoxic and mutagenic when meristematic cells were analyzed. However, there was no induction of micronucleus in F1 region. The seeds of A. cepa exposed to treated raw sewage sludge did not germinate and treated sewage sludge solubilized was cytotoxic and genotoxic. Despite these results, the sludges JM and M were in accordance with the brazilian law for heavy metals. However, sludge JM presented values above the maximum allowed by law for fecal coliforms. The results showed caution regarding the use of sewage sludge, especially when the have agricultural destination.

PT22. Genotoxicity evaluation of orange vinasse using Tradescantia pallida as a test organism

V. Daunano Gafati, São Paulo State University / Biology; Y. Ansoar, Unesp / Biologia; C. Souza, Sao Paulo State University - Unesp / Biology; R. Baston Souza, São Paulo State University Unesp / Biology; C.A. Christofoletti, Fundacao Herminio Ometto / Environmental Mutagenesis; C.S. Fontanetti, Sao Paulo State University - Unesp / Biology

Vinasse is an agricultural residue generated by industries using different types of crops, including sugarcane, corn, beet, wheat and orange. Its organoleptic properties are: dark brown slurry, acidic pH, high organic content, and unpleasant odor. As large volumes are generated, several alternative uses have been proposed for vinasse: avoid environmental problems, such as raw material for production of livestock and poultry feed, yeast production, energy production, fermentation and fertirrigation. The use of vinasse for fertirrigation can have impacts in both the soil and ground waters justifying the need for genetic level studies. Higher plants can be used as biomonitor to detect these impacts, one being Tradescantia pallida, that is highly sensitive to genotoxic agents. In T. pallida genotoxic damage from chromosomal breakage or loss is indicated by the presence of nuclear fragments (micronuclei-MN) in its reproductive cells. In this study, the effects of orange vinasse in the genetic material of T. pallida were evaluated with the MN test (Trad-MCN) following exposure to different concentrations of this vinasse. Twelve young inflorescences of T. pallida were exposed for 8 hours, followed by a recovery period of 24 hours. For the negative control, distilled water was used and for the positive control, 7.7 x 10^-3 mL-1 of methylmethylene sulfonate (MMS). Following the recovery period, the inflorescences were collected and fixed in Carnoy. Slides were prepared with acetic carmim and the ones containing tetrad phase cells were analyzed to determine the presence of micronuclei. The results were analyzed by IBAMPS Statistics Version 20 with the Kruskal-Wallis (p < 0.05). The results showed that the tested concentrations of vinasse increased the frequency of micronuclei, which demonstrates the genotoxic potential of the residue. These results indicate that the use of orange vinasse for fertirrigation requires appropriate preparation, since impacts in nontarget organisms can occur. Financial support: FAPESP 2012/50197 – 2014/21221-8

Environmental Legacy of the Antifouling Paints Biocides in South America

PT23. Environmental legacy of the antifouling paints biocides in South America

J. Castro, Universidade Federal de São Paulo / Instituto do Mar; M.R. Marchi, Unesp - Institute of Chemistry / Analytical Chemistry

The use of antifouling coatings has caused many environmental problems during the last decades in coastal areas under the influence of maritime activities. However, the banning of tributyltin-based antifouling paints issued by International Maritime Organization from September 2008, and its replacement by less persistent booster biocides, has led regulators and researcher around the world to consider the environmental issues related to tributyltin(TBT)-based
antifouling paints as an overcame problem. High TBT and impose levels are still being detected in many South American coastal areas. In addition, some booster biocides such as irgarol 1051 and diuron were recently found in environmental samples from South America. Moreover, recent studies have showed several toxicology effects these compounds on the marine organisms. Therefore, a detailed discussion on analytical techniques, levels and environmental effects of these compounds in South American coastal areas must be performed, enriched with a provocative reflection about environmental risk assessment needs for antifouling. Thus, during the special section "Environmental legacy of the antifouling paints biocides in South America" we intend to discuss results and perspectives pointed out by recent studies that have been conducted in the region on this serious environmental issue.

PT24. Paint Particles from antifouling systems in Patos Lagoon Estuary, RS, Brazil: Sources and Occurrence

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Antifouling Paint Particles (APP) may be generated during hull cleaning procedures and are normally found in areas under influence of boatyards and shipyards. The methods used in these facilities for paint removal may be related to different sizes of APP generated. In addition, antifouling paints tend to prevent the attachment of marine organisms, may contain different biocides in their formulations. Thus, the chemical composition of APP can be very heterogeneous considering the metals and organic biocides concentrations, even when inputted in the environment from a same source. According to a local resolution issued by Brazilian navy on the control of harmful antifouling systems in ships (Norman 23) is prohibited these waste disposal on the environment. However, this recommendation covers only antifouling paints tributyltin-based and there are no regulations on antifouling systems based in alternative biocides in Brazil. The present study aimed to identify sources and occurrence of APP at Patos Lagoon estuary. Initially, surveys were performed in the shipyards, local fishing communities and other boat maintenance facilities order to identify APP generation. The APP sources identification was based in samples of surface sediments obtained in 22 sites (13 in the shore and 9 along the estuary channel) using a Van Veen grab. After collection, the samples were stored in plastic bags, conducted to laboratory and frozen. Posteriorly, the sediments were sieved through 500 µm diameter mesh and coarse material was transferred to a petri dish and dried at 45°C overnight. This coarse material was examined using a microscope and visible APP were remover and weighed as a composite. The results indicated that 15 sites along the Patos Lagoon estuary contribute with large inputs to the area. The most of identified APP sources are facilities without waste destination. The analyses performed in sediments samples collected in front of these areas confirm this hypothesis since were founded significative APP amounts in samples from Rio Grande Yacht Club (0.17%), Santos shiyard (0.12%), Barra shipyard (0.03%) and Alemão shipyard (0.01%). In others sites, the APP amounts were less than 0.01% or absent. A recent study showed that LCSO of APP in euryhaline copepods Nitocra sp. was 0.14% therefore the APP levels detected in the present study are high enough to induce harmful effects to aquatic life from Patos Lagoon estuary.

PT25. Kinetics of sedimentation from CuO nanoparticles under multivariadic conditions

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Copper oxide nanoparticles have been used to produce antifouling paints for petroleum platforms and ships. The antimicrobial characteristic of this nanoparticle is useful for this application, but these innovative antifouling paints based on nanoparticles could cause several adverse effects to living organisms. However, the conditions on the aquatic environment could change the behavior of dispersed nanoparticles, varying the kinetics of the sedimentation that could influence in availability of these nanomaterials for the living organisms. Important parameters that could influence this characteristic are pH, salinity, concentration of nanoparticles and dissolved organic matter. This study aims to evaluate the multivariable effects on sedimentation of CuO nanoparticles in different conditions by a factorial design study. For this study was used CuO nanoparticles from Sigma-Aldrich with size -1and 10 g L-1; concentration of nanoparticles 50 mg L-1 and 100 mg L-1; pH 7.5 and 8.3 and concentration of EDTA 0,10 and 100 mg L-1. The kinetics of sedimentation was measured during 3 hours with a UV-Visible spectrometer from Perkin-Elmer, model Lambda 750 in the 500 nm wavelength. The results showed significant differences in pollution and contamination with confidence interval of 95% related to salinity and pH. Concentration of nanoparticles and EDTA were not statistically significant at the confidence interval. Lower pH and higher salinity could accelerate the sedimentation process. This behavior could change the toxicity of the nanoparticles on the aquatic environment by changing the sedimentation profile and the bioavailability. We suggest more studies to check the influence of these conditions on zeta potential, size distribution, solubility and toxicity of the nanoparticles to develop a risk assessment of this nanoparticle. Acknowledgements: This study was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq - Brazil) process number 200368/2014-1, Universidade da Região de Joinville and Universita QuêBec B Montr al.

PT26. Evaluate of antifouling compound toxicity synthesized from commercial soybean lecithin against sea urchin larvae.


Notorius is the fact that biofouling can cause many industrial and ecological problems. For many years, tributyltin (TBT) compound was widely used as active component in paint antifouling. Studies were show that this compound is highly toxic, being banned in 2008 around the world. Alternative studies based on natural compounds have been conducted to evaluate their effectiveness in antifouling paints. A compound synthesized from commercial soybean lecithin, a new antifouling agent, was tested to assess their chronic toxicity on larvae of the sea urchin Lytechinus variegatus. Larvae were incubated with six different concentrations (0.05; 0.5; 5; 10; 50 and 100 µg mL-1) and three controls (copper sulfate, solvent, and seawater). After 24 hour, 100 larvae were randomly selected (n= 300 for each test tubes) and individually examined for categorized in normal and abnormal development. The compound was potentially toxic between 100 and 50 µg mL-1, and the value of LCSO-24h was 56.34 µg mL-1. Larval development in sea urchin subject to all others concentrations did not vary significantly when compared to the seawater control. Copper sulfate was toxic at all concentrations. Our results suggested that the new antifouling agent synthesized is less toxic to invertebrates than traditional biocides (copper compounds and derivatives) and, thus, can be used as alternative for naval industries. More bioassays are needed to determine the ideal range of concentrations in which compound does not present toxicity for inclusion in antifouling paints.

Importance of microplastics as environmental contaminants of regional and global concern

PT27. Chemical Pollutants Adsorbed to Microplastics Transfer to Exposed Amphipods and Fish

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The contamination of the natural environment with plastic debris is an increasingly high-prioritised concern among regulators, scientists and citizens. Aside from negative impacts on natural aesthetics, plastic debris causes a range of ecological harm from entanglement to starvation when mistakenly ingested by animals. Plastic adsorbs and concentrates pollution from the surrounding environment, but the role that plastic debris plays in the movement of chemical pollution and contamination of food chains is largely unknown. Recent studies show that various plastics facilitate the bioaccumulation of pollution to exposed organisms. Our research demonstrates that marine amphipods and fish fed small microplastic particles, isolated from a commercial facial cleanser and contaminated with the persistent organic pollutants polybrominated diphenyl ethers (PBDEs), accumulated PBDEs in their tissues. In general uptake of higher-brominated congeners such as BDE-154 and BDE-153 were higher in

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comparison with lower brominated congeners such as BDE-28 and BDE-47. This study demonstrates that microplastics can act as a vector for the selective assimilation of POPs into marine organisms with the potential for transfer up food chains.

PT28. From humans to marine environment and wildlife: Brazilian initiatives to understand and minimize microplastics pollution

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Microplastics (MPs) are found in worldwide coastal areas, being recognized as one of the most serious environmental problems of the modern society. Nevertheless, we still lack understanding of several aspects of this problem, such as identification of where MPs tend to accumulate and the effects of their ingestion by organisms. Collaboration and engagement of a wide society range (e.g., government, industries and social society) are crucial to evaluate the extent of their presence and impacts, as well as to lower their input into aquatic environment. To address these issues we have been developing a series of research and actions on pre and post consumption plastics debris. Within the Marplot project, created in 2012 through a partnership between the industry and university (Plastivida and IO USP), we (1) evaluated the standing stock of plastics pellets in sandy beaches, where pellets were sampled until 1m depth along across shore transects in backshore and coastal dunes of 19 beaches located in 3 Brazilian states and; (2) are developing a “Zero loss of pellets program”, in which a manual to help different sectors of the industry to lower the loss of pellets to the environment was produced and the input rate of pellets will be used as an indicator of the efficiency of the program, thus regularly sampling the number of plastics pellets arriving at beaches located close to the largest port of Latin America (i.e. Santos Port) before and after the adoption of the program. At the same time, our group is investigating the microplastics’ risks for marine bivalves. (3) The presence of microplastics in wild mussels was evaluated along the Santos port channel, which is influenced by losses of MPs loading and unloading of ships and the irregular and regular disposal of domestic sewage, and (4) the biological effects of the exposure and intake of E/M PVC and microbeads by mussels evaluated in laboratory experiments considering possible variations in their concentration and period of exposure, as well as the effects of leached and virgin microplastics. Their effects were evaluated in different tissues (i.e. gills, digestive gland and haemolymph), trough different biomarkers (i.e. lysosomal membrane stability, lipid peroxidation, DNA damage and the stress proteins p38-MAPK, AIF-1, and HSP70).


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Microplastics are considered a new emerging pollutant. The manner that the plastics are discarded is not sustainable and it is causing serious environment issues. The North Pacific Ocean, the eastern garbage patch, is an area that is affected by massive and disproportional waste of plastic debris and the Great Lakes are no exception of this issue. Synthetic materials are used by every person in all societies and it is an important source of toxic compounds, such as PCBs, PAHs and organochlorine pesticides that most of them are endocrine disruptors, which can affect the human race. Large amounts of plastic debris have been documented on the Pacific Ocean Gyre as causing damage to sea organisms by entanglement and ingestion. Lake Superior has visible plastic debris on remote and otherwise pristine beaches and shorelines. Little information is currently available on the composition, distribution, fate of plasticic materials in freshwater ecosystems. An alarm has emerged with the discovery of plastic no visible by the naked eye on the Great Lakes waters. The research on the Great Lakes about plastic pollution needs to be addressed before the impact and consequences are disastrous on aquatic organisms. The first outcome of this research is designed to progress knowledge of quantification of microplastic plastic particles suspended in water, in air, accumulation of POPs onto these particles and ingestion by fish in the Great Lakes. The second outcome of this research is the results of extraction, identification and quantification of persistent organic pollutants from North Pacific Ocean plastic debris from 2014 (21 microplastics and 11 G/F/F filters) samples in comparison with results from 2005 (29 microplastics and 8 microplastics) and 2007 (40 microplastics) samples. In 2007 the analysis of seawater surface showed that contained microplastics and two microbeads. In 2014, the information added was macroscopic plastics dispersed into seawater at 10 m of depth. The results from the Great Lakes fish showed that microplastic fibers were present on fish stomachs in average sizes from 0.3 to 5.7 mm and in the air 0.01 to 7.5 mm. The main kind of synthetic plastic found on the surface ocean and water lakes.

PT30. Plasticizer endocrine disruption: BPA effects in Caiman latirostris reproductive system

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Humans and wildlife are daily exposed to contaminants which have the potential to interfere with their endocrine system by acting as endocrine disrupting compounds (EDCs). Plasticizers are the most common plastic additives; they are often not covalently bound to the plastic matrix, and thus can slowly diffuse out of plastics leading to wide environmental contamination. Bisphenol A (BPA) one of the most important plasticizers is recognized as EDC with estrogenic activity and thus catalogued as an environmental estrogen. The effects of EDCs depend on their level and time of exposure, as well asagina in particular, being especially critical when exposure occurs during development. Caiman latirostris a species with temperature sex determination are widely distributed in South American aquatic ecosystems. Caimans spend a large portion of their lives in the water, they are long-lived animals, and they are at the top of the food web. All these make them particularly interesting to EDCs exposure. We demonstrated that in ovum exposure to BPA causes estrogen-like developmental effects in caimans by reversing gonadal sex and altering gonadal histotarchitecture. The testes of BPA-exposed caimans presented testortous seminiferous tubules with empty tubular lumens and the oocytes exhibited multinucleate follicles and altered follicular dynamics. Besides that, levels of sex steroid hormones were modified. Differences in responses to BPA and E2 in our in vivo system were on the order of 100 fold thus, the relative estrogenic potency of BPA in C. latirostris embryos is significantly higher than expected, according to in vitro bioassays. This is especially significant in terms of the impact that environmental BPA could have on gonadal development and reproduction of C. latirostris and perhaps on other wildlife species. Not only in ovum but early post natal exposure to BPA lead to changes in caimans reproductive organs. C. latirostris oviductal maturation is a postnatal event characterized by changes in luminal epithelium and in the subepithelial stroma. Oviductal adenogenesis follows gradual collagen disorganization and increased expression of smooth-muscle proteins. Early postnatal exposure to E2 or BPA increased the area of subepithelial stromata occupied by poorly organized collagen and by muscle cells. Alterations described could compromise not only caiman sexual maturation but also lead to decreased fertility; highlighting the importance of preserving the aquatic environments from plastic pollution.

PT31. Microplastics pollution in Scotland, a case study: quantification and characterisation of particles in coastal waters

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Among the most prominent and ubiquitous anthropogenic changes in the marine environment has been the accumulation of plastic debris. Of increasing concern is the abundance and distribution of small plastic particles (< 5 mm), known as microplastics (MPs), which can be produced by fragmentation of larger pieces of plastic or manufactured as microbeads (e.g. used in cosmetic products) and directly released into the environment. Monitoring the presence of microplastics in coastal waters contributes to the evaluation of the effectiveness of Government initiatives to reduce plastic waste. The aim of the present study was to develop methods to quantify the presence of microplastics in coastal waters in Scotland, and to use this data as a case study that can be applied in other areas. In the first year, intertidal sediment samples were collected in the shores of the Forth mouth, Edinburgh; Musselburgh (South) and Burntisland (North). Fragments were examined through the process of precipitation/floatation in a supersaturated NaCl solution. Particles were sorted and representative MPs were used for polymer identification (Raman microscopy). Initial data mapped using GIS suggests that the majority of MPs found were fibrous polypropylene. On several sites along
the North shore there was a substantial number of larger plastic nurdles. In the second stage, a standardised procedure was established for extraction and quantification of MPs in two marine mussels, Mytilus edulis (intertidal) and Modiolus modiolus (subtidal) collected from the East and West coasts of Scotland. Previously used methods for extraction and quantification of MPs from marine organisms (e.g. use of strong acids or bases) are likely to damage MPs. We developed a new method based on enzymatic digestion that is relatively easy, reproducible, and provides good recovery rates of MPs from spiked tissue samples. Based on this method, processing samples of mussels collected from various field sites on the East and West coast of Scotland is ongoing and we anticipate providing information on the level of MPs contamination in mussels according their site of collection and habitat. A field campaign is underway that involves transplantation of M. edulis into purpose built cages and use of passive water samplers to quantify MPs presence and abundance at specific sites on the Scottish coast.

In Colombia are almost null the studies of Citizen science projects supported by schoolchildren who investigate the problem of plastic pollution in the sea water. The pellets from the sea water, concentrated in beaches and rivers, can become a source of contaminated pellets for the adjacent marine environments. The pellets end up in the marine environments due to losses during the processes of production, transport and manufacturing, and in the last few years, microplastic pollution in coastal environments has become of main concern. The present study describes the spatial distribution of pellets on sandy beaches along the central portion of the São Paulo coast (Southern Brazil), a region that is under influence of the Port of Santos, and analyzes the variability in the concentration of Polychlorinated Biphenyls (PCBs). We sampled pellets in eight beaches, using a 14x14m quadrat with 3 replications in 3 points, at the superficial sand layer. Afterwards, pellets were classified by color and some were separated for chemical analysis. A total of 4,277 pellets were collected. A decreasing gradient of pellets concentration along with the increasing the distance from the Port of Santos (rPearson=0.48083). White (43%) and clear yellow (20%) pellets were predominant, representing a potential threat to the marine animals, in special the marine birds, which selectively tend to ingest pellets with these colors. The PCBs were found in all samples, in high concentrations (1471.36 to 3891.84 ng/g-pellet). Some pellets from our study presented the highest PCB concentrations in the world (>3544.75 ng/g-pellet). All the other sites presented pellets with PCBs concentrations ≥1471.36 ng/g-pellet, 12 times higher than the maximum value permitted by Brazilian standards for sediments on industrial areas and 49 times higher than the sea water. The pellets from the farthest beach (Itaguara), supposedly to be the control area, presented the highest PCB concentrations in this study, indicating that contaminated pellets area not be restricted to harbor zones. Our results show the influence of the Port of Santos as a source of pollutants for the adjacent marine environments. The concentrations of PCBs in plastic pellets are surprisingly high in the studied area, and probably represent a relevant threat to the marine biota.

Wherever possible they were accompanied by trainers, who supported the teacher in supervising the sampling process. More than 3000 students and 300 teachers from all over Chile (Continental Chile from Arica to Punta Arenas, Eastern Island and Juan Fernandez Islands) have participated. These activities revealed that in Chilean beaches the average of macrodebris is 1.8 items per m2, mainly plastics, cigarettes butts and glass. The microplastics abundance is 30 items per m2 at the continental coast, and 800 items per m2 at Eastern Island. Also, that a vast percentage of Chilians admits to have littered at beaches and considered that environmental education is the better solution for the marine debris problem. The experience of Cientificos de laBasura shows that schoolchildren are enthusiastic researchers and expressed interest in participating in future environmental projects. We suggest that involving schoolchildren in citizen science projects will not only enhance the spatial and temporal scale of data collection of marine debris and microplastics, but also support school curricula, public understanding of the scientific process, and environmental management decisions.

PT32. Polychlorinated Biphenyls (PCBs) in plastic pellets in beaches close to Port of Santos.
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Plastic pellets, or nubs, are small plastic granules (< 5mm) that serve as raw material for production of many manufactured plastic products. They can be composed of different polymers and present plastic additives in their composition; moreover, hydrophobic contaminants can be adsorbed into the pellets. Plastic pellets end up in the marine environments due to losses during the processes of production, transport and manufacturing, and in the last few years, microplastic pollution in coastal environments has become of main concern. The present study describes the spatial distribution of pellets on sandy beaches along the central portion of the São Paulo coast (Southern Brazil), a region that is under influence of the Port of Santos, and analyzes the variability in the concentration of Polychlorinated Biphenyls (PCBs). We sampled pellets in eight beaches, using a 14x14m quadrat with 3 replications in 3 points, at the superficial sand layer. Afterwards, pellets were classified by color and some were separated for chemical analysis. A total of 4,277 pellets were collected. A decreasing gradient of pellets concentration along with the increasing the distance from the Port of Santos (rPearson=0.48083). White (43%) and clear yellow (20%) pellets were predominant, representing a potential threat to the marine animals, in special the marine birds, which selectively tend to ingest pellets with these colors. The PCBs were found in all samples, in high concentrations (1471.36 to 3891.84 ng/g-pellet). Some pellets from our study presented the highest PCB concentrations in the world (>3544.75 ng/g-pellet). All the other sites presented pellets with PCBs concentrations ≥1471.36 ng/g-pellet, 12 times higher than the maximum value permitted by Brazilian standards for sediments on industrial areas and 49 times higher than the sea water. The pellets from the farthest beach (Itaguara), supposedly to be the control area, presented the highest PCB concentrations in this study, indicating that contaminated pellets area not be restricted to harbor zones. Our results show the influence of the Port of Santos as a source of pollutants for the adjacent marine environments. The concentrations of PCBs in plastic pellets are surprisingly high in the studied area, and probably represent a relevant threat to the marine biota.

Detection of Endocrine Disruptors and Other Micro pollutants through Effects on Aquatic Organisms

PT34. Accumulation of PAHs and heavy metals by marine microplastics in the north of Scotland
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Microplastics (pieces of plastic measuring < 5 mm) are a widespread and often ubiquitous component of the natural environment. The relentless use and release of lightweight and durable plastics during the last century has resulted in greater environmental densities of primary and secondary microplastics, which are now a common component of marine litter. However, there is still little understanding regarding the distribution of microplastics in remote and rural regions, and their impact on biological and ecological systems. Microplastics pose a potential threat to a number of species as they can accumulate organic pollutants and heavy metals and then be consumed. We examine this potential threat by examining sites adjacent to the Pentland Firth, a sea strait between the Scottish mainland and the Orkney Islands, renowned for its very strong tides, and high flow of water, and is a designated site for imminent marine renewable devices. The Pentland Firth channels a significant proportion of water and therefore represents a major channel by which microplastics from the Atlantic may be distributed to Scandinavia and north west Europe. Consequently, we address two aspects which are: 1) examine marine environments adjacent to a high flow marine system to determine the presence, and quantify the abundance of microplastics and 2) establish and quantify the ability of plastics in the marine environment to adsorb polycyclic aromatic hydrocarbons (PAHs) and heavy metals at sites around the coast of Caithness, Sutherland, and Orkney Islands in the far north of Scotland.

PT35. Avances en estudios de perturbación endocrina reproductiva en peces nativos de la Orinoquia Colombiana
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Las actividades antropogénicas han conducido a un deterioro progresivo de los ecosistemas, siendo los cuerpos de agua vulnerables a la contaminación ambiental. Diversas alteraciones sobre los organismos vivos son ocasionadas por dichos contaminantes, dentro de los cuales los efectos sobre el sistema endocrino en humanos y animales ha generado gran interés debido a su efecto deletéreo sobre los organismos ecológicos. Las actividades que generalmente alteran el sistema endocrino se han denominado compuestos de perturbación endocrina (EIDC). En Colombia son casi nulos los estudios de perturbación endocrina en especies nativas, por tanto uno de los intereses del grupo de investigación BioTox de la Universidad de los Llanos se fundamenta en estudiar el impacto de los EIDC sobre organismos acuáticos. Para este fin se han llevado a cabo estudios en dos especies nativas de peces Acipenser mete y Astyanax gr. bimaculatus como modelos para estudios de perturbación endocrina en la Orinoquia Colombiana. Se han conducido exposiciones durante 21 días a eitilestradiol (EE2) tanto en hembras como en machos, evaluando variables de respuesta endocrina. De igual modo, cyp19a1a y cyp19a1b en A. metae se evaluaron en hembras y machos, evaluando variables de respuesta endocrina. De igual modo, cyp19a1a y cyp19a1b en A. metae se evaluaron en hembras y machos, evaluando variables de respuesta endocrina. De igual modo, cyp19a1a y cyp19a1b en A. metae se evaluaron en hembras y machos, evaluando variables de respuesta endocrina.
coli JM109 for the posterior secuenciamento del gen de estas aromatasas. Los resultados evidenciaron diferencias en las variables de respuesta de las dos especies. En Astyanaxs g. bimaculatus se observó un efecto deletéreo de E2 en los índices gonados (IGS) y hepatosomáticos (IHS); sin embargo, en A. metae dicho efecto no se evidenció claramente. Los análisis histológicos han revelado alteraciones a nivel testicular y ovarico en los peces expuestos a las mayores concentraciones de E2. A nivel molecular, se secueñecció y se identificó satisfactoriamente fragmentos del gen de cyp19a1a y cyp19a1b en A. metae. Se observó que A. metae y A. g. bimaculatus no responden a E2 de la misma manera. Los resultados obtenidos a la fecha se constituyen en los primeros realizados en peces nativos colombianos evaluando los efectos de sustancias xenotestrogenicas. Igualmente, estos estudios son pioneros ya que se ha logrado identificar el gen de la aromatasa en A. metae como biomarcador de perturbación endocrina.

PT36. Toxicity of E2 and E2: cell damages in zebrafish male gonads and biological recovery

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This study aimed to evaluate the toxicity of 17β-estradiol (E2) and 17α-ethynylestradiol (EE2) hormones on zebrafish adult males (Danio rerio) exposed to chronic tests in laboratory using concentrations present in nature (30 ng.L⁻¹, nominal concentration). The application of two treatments (powdered activated carbon- PAC, and aquatic haum substrates - AHS) to remove these hormones from water were also evaluated through biological recovery tests performed using the same organisms, and histological analyzes of male gonads were used as toxicological biomarker. Twenty six fishes were exposed to each experimental condition (control, E2 and EE2) during 21 days. At 21th test day, randomly selected organisms (n=3) were euthanized for gonads removal. The remaining fishes then followed toxicological recovery tests for seven 7 days with test solutions enriched with PAC (0,5g.L⁻¹, n=12) or AHS (20 mg L⁻¹, n=11) for two hours in shaker and, at 28th test day, the same number of organisms (n=3) were selected for gonads extraction. The gonads were submitted to fixation (Bouin liquid over 18 hours), washing (running water over 12 hours), dehydration (with 70% alcohol), and were included in paraffin. Serial sections (4 µm) were obtained with microtome and stained with hematoxylin-eosin (HE). Qualitative analysis was conducted through a light microscopy and classified (OECD, 2010). The results were compared, before and after the period of biological recovery. Histological analysis revealed widespread cellular damage in gonadal tissue after chronic exposure to EE2, as the increased cell volume, degeneration, and sperm cells. In contrast, no harmozone, these changes were maintained irreversible for 7 days of biological recovery with both treatments. Males of control and EE2 group apparently showed no visible histological changes based on analyzes conducted at the end of each assay. Biological injuries observed at the cellular level in this research highlights the cells as the primary target of environmental contaminants responsible for the environmental improvement. Therefore, our results warn about the impact of female sex hormones found at low concentrations and long-term exposure to aquatic organisms, and its implications for the preservation of the species in their natural environments. More investigations to find out about the potential reversibility of such injuries and an acceptable concentration for the exposed organism should be performed.

PT37. Molluscs and endocrine disruption - progress in the development of biomarkers

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With around 85,000 registered mollusc species, the Mollusca phylum is the second largest animal phylum. Despite their wide terrestrial, marine- and fresh water distribution and importance to almost all ecosystems as well as human economic activities (food and as agricultural pests), much knowledge is still lacking in relation to their endocrinology including the endocrine control of reproduction. The main reasons for this lack of knowledge have been a general focus on vertebrate endocrinology and that molluscan endocrinology seems much less preserved between classes and species than is the case for vertebrates. It has been known for decades that many mollusc species can be affected at population level by the antifouling agent TBT (tributyltin) via endocrine mode(s) of action. However, increasing attention has been given to effects of endocrine disrupting chemicals (EDs) on molluscs over the latest years, including initiation of development of OECD test guidelines (TG) to assess the effect of EDs in molluscs. One of the main challenges with the development of standardized tests to detect ED effects in molluscs is the lack of validated endocrine specific endpoints/biomarkers. Attempts have been made to copy biomarkers developed to detect chemicals affecting the vertebrate steroid hormone system to molluscs. One example is the estrogen dependent vertebrate yolk protein precursor vitellogenin used as a biomarker for estrogenic exposure in fish for decades and included in several OECD fish TGs: It has been proposed that yolk proteins in molluscs have the same estrogenic dependence and they have been used as biomarkers for estrogenic exposure in molluscs. This is controversial because the direct link between mollusc yolk proteins and vertebrate steroid hormones has not been verified. Further, the yolk protein quantifications have been performed with non-validated indirect alkali-labile phosphate (ALP) methods that have been outdated in vertebrate yolk protein quantification for years. The present work investigates and discuss the possible applicability of yolk proteins in molluscs as biomarkers for exposure to endocrine disrupting chemicals and especially the specific use of yolk proteins as biomarker for estrogenic exposure in molluscs. We have developed antibodies against yolk protein from three species (two bivalves and one gastropod) and present results of exposure to both vertebrate- and invertebrate types of hormones and EDs.

PT38. Cytochrome P450 induction and antiestrogenic effects caused by trace levels of contaminants in farmed rainbow trout

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Fish can be exposed to trace levels of contaminants that induce detoxification processes and endocrine disruption. These effects can be so subtle that no external damage is observed in fish. However, essential functions as growth, sexual development or reproduction can be compromised. Exposure to these contaminants can be evidenced by measuring the induction of detoxification related cytochromes. For instance, cytochrome P4501A (CYP1A) is induced by polycyclic aromatic hydrocarbons and other related chemicals. On its hand, CYP3A is activated by a wide variety of substances including a number of pharmaceuticals. The main objective of this work was to determine if farmed rainbow trout (Oncorhyncus mykiss) were really affected by trace levels of contaminants and to characterize the damage provoked on animals. For that, three different approaches were used simultaneously: biomarker measurement, chemical analysis, and active biomonitoring (ABM) transferring the animals to clean waters. Regular samplings were performed all along three years in several fish farms and the induction of CYP1A and CYP3A was studied at the transcriptional and enzyme (by measuring CYP1A and CYP3A dependent EROD and BFCOD activities, respectively) levels. Strong inductions of CYPs, showing actual exposure to contaminants, were observed at different dates in two fish farms. Extracts from sediments taken from the water entry channels of fish farms also activated EROD activity in a rainbow trout cell line maintained in vitro, corroborating the presence of contaminants in these sediments. In ABM experiments, CYP1A and CYP3A inductions disappeared after some days of fish being in clean waters, confirming the presence of chemicals in waters. In sediments, some anthropogenic chemicals were detected. However, they were not able to induce enzyme activities in the in vitro experiments, indicating that other substances, different from those detected by chemical analysis were responsible of the observed effects. These results suggest a real exposure of fish to very low concentrations of mixtures of pollutants whose interactions is possibly provoking the reported inductions. Acknowledgements: this work was financially supported by INIA project RTA2012-00053-00-00

PT39. Altered endocrine signalling in freshwater fish and amphibian model organisms in response to crude oil exposure

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Crude oil pollution is a global environmental concern, and has been linked to health disorders in various aquatic vertebrate species. The bulk of research have however been focused on marine organisms whereas little is known regarding the potential health effects of crude oil on freshwater aquatic vertebrates. In this study we used African clawed frog, Xenopus laevis, tadpoles, and juvenile Mozambique tilapia, Oreochromis mossambicus, as model organisms to study the potential effects of crude oil on the endocrine systems of freshwater vertebrates. In particular, the expression of selected key genes associated with endocrine signalling and metabolic homeostasis were quantified in individuals exposed to crude oil water accommodated fractions or surface waters potentially contaminated with crude oil. Recombinant yeast bioassays were furthermore applied to evaluate the interaction of crude oil with the estrogen and androgen receptors. Water accommodated fractions of crude oil were found to target the reproductive and thyroid hormone systems. The crude oil exhibited potent anti-androgenic activity in vitro. Our data, therefore, provide evidence that crude oil pollution may result in adverse health effect in freshwater fish and amphibians, although a discrepancy between in vitro and in vivo response were observed, suggesting that the sole use of in vitro data for risk assessments may be misleading.

PT40. The use of in-vitro bioassay to assess the environmental quality of Brazilian estuarine sediments

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Estuarine sediments may contain multiple classes of organic pollutants due to economic, urban and harbor activities. PAHs, pesticides and PCBs have already been identified in Paranagua estuary (Parana, Brazil) and are recognized to have adverse effects on the organisms even at low concentrations. In fish ovaries, androgens are converted into estrogens by cytochrome P450 aromatase (CYP19). The interference of pollutants with this enzymatic pathway may be a potential mechanism of endocrine disruption by affecting sexual differentiation and gamete growth in fish. The aim of this study was to characterize the environmental quality of sediments collected in eight different sites of the Paranagüa estuary. Gonad subcellular fractions from female sea bass (Dicentrarchus labrax) were used to detect the presence of compounds that are likely to act as endocrine disrupters in sediments by interfering with the synthesis of estrogens (ovarian CYP19). Four different concentrations of the sediments extracts were tested to evaluate the action on the enzyme. At 60 mgQsed/mL the inhibition ranged between 67.8 and 87%. At 20 mgQsed/mL the inhibition of ovarian CYP19 ranged from 48.6 to 79.8%, at 10 mgQsed/mL from 31.6 to 69.4% and at 2 mgQsed/mL from 7.8 to 31.4%. High aromatase inhibition was observed in six from eight extracts at 20 and 10 mgQsed/mL. Stations S3 and S11 presented the lowest capacity of inhibition when tested at these concentrations. At lowest concentration, the inhibition was reduced and it was possible to better differentiate the endocrine disruption potential of the stations. Station S7, in the inner part of the estuary, had the strongest inhibitory effect on CYP19 at 20 and 10 mgQsed/mL. In addition, the results were correlated with total organic content (TOC), grain size and concentrations of organic compounds in sediments. The station S7 presented the highest concentration of TOC and DDTs of the sediments collected. To our knowledge this is the first report on the effects of these sediment samples on key steroidogenic enzymes in fish gonads. The results allowed identifying the existence of a potential endocrine disruption in the sediments and determining the differences between the sites. This will help to discriminate those sites that could cause risk to aquatic organisms and to identify potentially impacted areas that require further action to improve their environmental quality.

PT41. Persistent Organic Pollutants and endocrine disruption in fish and amphibians of the Verde and Santiago Rivers in Mexico

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Persistent Organic Pollutants (POPs) which are among the main environmental contaminants. Some POPs are capable of altering vertebrate endocrine system, reproductive abnormalities have been registered in diverse populations of wildlife and humans. The present study had the objective of evaluating exposure to POPs and endocrine disruption in wild fish and toads from the Santiago and Verde Rivers in Jalisco, Mexico. Three sampling stations were established representing three distinct scenarios (rural – Verde River-, urban, and agro-industrial –Santiago River-). The quantification of POPs in environmental and biological samples was done using the method of gas chromatography with spectrometer mass. Fish where captured using artisanal techniques and toads where hand captured. Determination of the vitellogenin (VTo) was done using an indirect colorimetric technique alkaí labile phosphorus (ALP). The concentrations of total POPs in environmental (soil and sediment) and biological samples (liver tissue and muscle from fish) were higher in the sampling station with agro-industrial activity, followed by the urban and rural stations. Concentrations of hexachlorobicyclohexanes (alpha, beta and gamma) in soil and sediment, as well as concentrations of total DDT levels in sediment were found to be above the limits established by the Canadian Guide for Environmental Protection. The levels of brominated compounds (PBDEs) found in the present study are not high in comparison to the ones reported in studies done in other parts of the world. The toads that were captured in the rural station had total POP concentrations below the values registered in toads from the urban station. The highest VTo level was registered in fish from the agro-industrial station, followed by the urban and the rural stations. The levels of VGT in toads from the rural station were higher than the levels reported in toads from the urban station. The biomonitor that were evaluated in the present study are exposed to low levels of POPs. An existing endocrine disruption was registered in wild fish and toads from the Verde and Santiago Rivers. This study allowed for the gathering of evidence to take place on the environmental impact, to which species living in the Verde and Santiago Rivers are exposed to. Information related to biomarkers of exposure and effect was also generated, and can be used along with other national investigations to establish an official norm in Mexico.

PT42. Effect of benzo-a-pyrene on gene expression of Cyp1A and hypophysyal factors in Cyprinus carpio

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The compound benzo-a-pyrene (BaP), a representative member of toxic polycyclic aromatic hydrocarbons, has been reported to induce Cyp1A activity in many fishes. With the aim to establish a biomarker indicative for dioxin like contamination in the aquatic environment, we analyzed the effect of BaP on gene expression of Cyp1A in liver of adult male carp. Carp were caught from surroundings of Valdivia, held in an earth pond with flow through of water from the same system at natural temperature and photoperiod for two weeks. Male carp were injected intraperitoneally for three consecutive days with BaP (1mg/kg) and control fish with vehicle only (oil: etanol 9:1), sacrificed the fourth day and tissue was prepared for RNA extraction according to Chomzyński and Sacchi (1987). RT-qPCR analyses was performed with specific primers for Cyp1A, vitellogenin (vg), and metallothionein (mt) normalized for beta-actin expression. Specificity of all amplicons was verified before by cloning and sequencing. Clearly, an 20-time increase of cyp1A transcripts in liver of BaP treated (n=4) with respect to mock treated carp (n=4), confirmed a physiologically relevant response in these fish to BaP. In addition, RT-qPCR analysis for two significant downstream targets for Cyp1A, vitellogenin (vg), and metallothionein (mt) was performed for BaP treated (n=4) and control (n=4) carp. This analysis showed a significant increase above the control levels. These results suggest that BaP does elicit aryl hydrogen receptor signalling pathway, but does not cross react with other pathways, such as estrogen receptor or factors involved in metal response in these experimental fish. In parallel in these individuals with a clear response to BaP, gene expression of hypophysyal factors will reveal effects on a series of hypophysyal factors involved in coordination of growth and health in the whole animal. Thus, this approach will help to shed light on complex effects of BaP in vivo in a whole adult organism. Acknowledgement: DID SE2015-02

Alternative Methods of Testing and Fitness for Assessing Perturbation

PT43. Application of Toxicity Identification Evaluation (TIE) in the Santos Estuarine System sediment using the benthic organism Nitokra sp

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The TIE approach (Toxicity Identification and Evaluation) aims to identify the contaminants responsible for the initial toxicity in samples of complex mixtures (e.g. effluents, interstitial water, whole sediment). This is done through the combination of toxicity testing and simple chemical manipulations, selectively
altering the toxicity of specific classes of contaminants. Recent publication has been addressing the development and application of TIE for assessing marine sediments. Although this is an important tool for environmental quality assessment, no standard protocols are available. Assays using pelagic organisms is commonly used for the evaluation of interstitial water toxicity, but tests with benthic organisms may be more appropriate to evaluate the toxicity of the interstitial water because they are better adapted to the natural conditions of the benthic habitat (particulate matter, pH, ammonia levels and sulfides), which minimizes cases of “false positives”. The aim of this study was to identify the contaminants responsible for the toxicity of the interstitial water from sediments of the Santos Estuarine System, using acute mortality tests with Nitokra sp nauplii. This is a potential species to be used in TIE studies, because of its benthic habits, ease of cultivation and manipulation. TIE manipulations were applied in the interstitial water extracted from sediment samples collected along the Santos Estuarine System (an industrial, port and urbanized area), specifically in the domestic sewage outfall (P1), the port’s fuel terminal (P2) and under the influence of the petrochemical and siderurgical industry (P3), using: (i) the addition of EDTA; (ii) aeration at acid and basic pH; (iii) C18 solid phase extraction; (iv) and the sublation test. The TIE in the P1 showed the toxicity due to metals, non-ionic organic, ammonia and sulfide. In P2, manipulations indicated ammonia, sulfide and metals as primarily responsible for the toxicity of the interstitial water. In P3, the toxicity of organic compounds, ammonia and sulfide was evidenced. The application of the TIE in the marine interstitial water using benthic organism Nitokra sp. was considered appropriate, in addition to providing a more precise analysis of the causes of sediment toxicity in this area, indicating the contaminants that offer risk to biota.

PT44. Elemental composition of intertidal estuarine sediments as human impact marker

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South-American estuarine transitional waters at the Atlantic Ocean present regions already affected or at risk of anthropogenic due to urbanization and industries settlement. Elemental composition of the intertidal sediment is an excellent marker to detect any impact, and may exert a bottom-up influence by natural concatenation to higher organization levels (e.g. molecules, cells, organisms, communities). Regionalization of elemental composition along the estuary axis was analysed, disentangling a potential shift produced by human impacts. In this context, the association of elements within them and with anthropic activities were investigated along the Rio de la Plata estuary. We predict that most abundant elements in the estuary are the natural earth-crust components and these will not show any evident gradient along the estuarine axis. Elements involved in human related processes will shape concentration gradients from the most probable source (i.e. cities). The research strategy involved sampling intertidal habitats all along the estuary, registering environmental variables and the elemental composition in the intertidal sediment. Sampling sites repeat the transect along the estuarine agricultural and urbanized areas along 428 km long covers inner, middle and outer Rio de la Plata estuarine zones and a coastal fringe of oceanic beaches. Oxic sediment samples were collected, liophilized digested with HNO3-HF-HCl and 1 N HCl, and elements were measured by ICP-OES. More abundant elements measured were Al, Fe and Ca in all samplings. Anthropic marker elements such as Cr, Pb, Zn and Cu were found even at toxic levels in beaches corresponding to Montevideo city coast. Ordination of samples highlights the distinctive state of urban beaches, placed unaccompanied along the first principal component, position mainly driven by human impact marker metals. Results highlight the measurement of elements in sediment as a good tool to detect shifts in an estuarine system.

PT45. Evaluación de la fecundidad de Chironomus colombiensis en aguas con diferentes impactos antrópicos

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Se evaluó la fecundidad de C. colombiensis como herramienta de diagnóstico de la calidad del agua en áreas impactadas por minería, ganadería y agricultura de tres quebradas de una microcuenca de los Andes colombianos. Se siguió la metodología propuesta por la OECD 218 y 219 para evaluar la fecundidad en la generación F1 y F2. Se realizaron cuatro tratamientos: dos de minería (mercurio y cianuro), uno de agricultura y uno de ganadería, más un control con agua reconstituida y se hicieron dos réplicas con un N = 60 larvas por cada uno. Los experimentos se llevaron a cabo en acuarios de 35 x 30 x 15 cm bajo condiciones estandarizadas de laboratorio con un fotoperiodo de 12:12 y recambio del 50% del agua una vez por semana. Se encontró que la menor fecundidad se presentó en los individuos de la F2 expuestos al agua contaminada por agricultura (X = 298) en comparación con el control (X = 399), presentando una disminución del 25% en el número de huevos. Después de realizar una Prueba de Kruskal-Wallis y F test of Dunn se encontró diferencias estadísticas (p < 0.01) entre el agua contaminada por agricultura y cianuro y el agua de la F1. En la F2, el tratamiento con agua contaminada por agricultura fue diferente a todos los otros. Los resultados obtenidos indican que la fecundidad de C. colombiensis se ve afectada por la contaminación, especialmente por residuos agrícolas. Esto puede deberse a la frecuencia e intensidad con que se utilizan los agroquímicos en el control de plagas y la fertilización de los cultivos, los cuales se filtran al agua alterando la diversidad y riqueza del ecosistema. Así mismo, los plaguicidas tales como insecticidas, fungicidas y herbicidas, conjuntamente con el resto de los agroquímicos y algunas prácticas agrícolas, pueden afectar la vida silvestre, causando una reducción de las poblaciones de una forma no evidente, incidiendo a cambio en la estructura de las comunidades, la función biológica de los organismos, afectando su ciclo de vida, crecimiento y su condición reproductiva, lo cual se debe reflejar en este estudio. Estos resultados indican el potencial de la fecundidad como herramienta para la evaluación de los recursos hídricos.

PT46. Marine debris: implications for conservation of rocky reefs in manabi, ecuador

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Management of marine debris (MD) is a problem of global concern due to its impacts on the marine diversity and productivity. Current situation of MD and its implications in the conservation of marine ecosystems are completely unknown in the continental coast of Ecuador. Composition and distribution of submerged MD were evaluated in two rocky reefs in the province of Manabi by diurnal underwater surveys with time transects and considering three geomorphological areas: crest, slope and bottom. Observed items of MD were classified in 5 categories according to their source and use. Density of MD was expressed as items of MD km-2. Plastic containers and monofilament nets showed the highest frequencies of occurrence in study sites. 63% of MD items at both sites were associated to fishing activities. MD composition showed significant differences between sites and geomorphological areas. Differences in composition between geomorphological areas were mostly driven by monofilament nets in the crest, monofilament lines in the slope and plastic containers in bottom zone. Plastic containers were the MD category contributing most to the dissimilarities between study sites. Disposal of MD items was determined by the influx of visitors and fishing activities at sites, while accumulation and distribution statistics were modulated by direction and intensity of ocean currents and spatial orientation of the reefs. We recommend establishing a sampling protocol in order to allow spatio-temporal variability assessment of the MD. The resulting information would be very useful for a proper management of the MD and would support the implementation of conservation and recovery programs towards affected marine ecosystems.

PT47. Midiendo la perturbación ambiental con ensayos de exposición no forzada: la respuesta de fuga a la contaminación

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Los efectos tóxicos de los contaminantes sobre los organismos son basados en métodos de ensayos en los que los organismos son forzosamente expuestos a una dada concentración en un sistema confinado. Aunque ampliamente estandarizado, este tipo de exposición no tiene en cuenta la habilidad de los organismos en detectar niveles de contaminación potencialmente nocivos y evitar sus efectos dañinos, huyendo a zonas menos perturbadas. Asimismo, la exposición forzada no contempla la formación de un gradiente de contaminación que suele ser formado en los ecosistemas acuáticos. Esta respuesta de huida de la contaminación, conocida como fuga (avoidance), suele ocurrir a bajas concentraciones y en periodos de exposición extremadamente cortos comparado a otras respuestas. Además, a nivel local, la fuga puede tener serias consecuencias en la estabilidad de la población y sus patrones de migración. A través del uso de la exposición no forzada y de la evaluación de la fuga como respuesta ecotoxicológica, es posible verificar cuando la presencia de los contaminantes puede causar una perturbación ambiental sin que se aprecien efectos tóxicos directamente en los individuos. En la presente exposición, se darán a conocer los
PT48. Sediment toxicity in Guanabara Bay (BR), the venue for 2016 Olympic Sailing Competition.

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Guanabara Bay (GB) and its vicinities concentrate approximately 70% of the industries of the State of Rio de Janeiro. The combined discharges of industrial effluents, residues, and the domestic sewage inputs grant to GB the status of one of the most polluted areas of Brazilian coast. Despite the GB's ecological relevance, and the capability of estuarine regions and bays to accumulate contaminants, Guanabara Bay will host the 2016 Olympic Sailing Competitions, which will be the first Olympic Games held in an environment under bad environmental conditions. Sediment are important indicators of environmental quality an thus, the present study aims to assess the toxicity of sediments collected in five different sites from GB: Two harbor areas, Rio de Janeiro (P1) and Niterói Port (P2), one industrial area (P3), one high urbanized area (P4), and a more distal mangrove area (P5), that was expected to be less affected by pollutants. Mortality rate in % was used as acute toxicity endpoint for the amphipod Tiburonella viscana, thanetanbid Kalliapseudes schubarti and the clam Anomalocardia brasiliana. Chronic toxicity effects were assessed on the reproduction rate of the copepod Nitocra sp, and on the burial time of the clam A. brasiliana. The results exhibited acute toxicity for all tested organisms especially in harbor (P1) and Industrial areas (P3). All samples were toxic in chronic test for the copepod Nitocra sp, reproductions rates were about four times lower than the exhibited by the control group. The clams exposed to sediments from all sites presented inhibition in the burial time. Although the depollution plan of GB was set up as a promise by the government and organization of as legacy of Olympic Games, the sediment toxicity indicates poor quality of environment in GB and corroborates the concern of the Olympic Committee, athletes and general public regarding to the pollution during Olympic events.

PT49. Selección del Hábitat en Alevines Tilapia: la Fuga de la Contaminación Frente la Disponibilidad de Alimento

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The assessment of the biological effects of low level exposure to chemical agents can obtain a paradoxal dose-response pattern, where can be observed a response called hormesis, which postulates that molecules can have a different response pattern from the traditional linear dose-response model at ultra low concentration. In hormesis there is a homeostasis disruption under ultra-low concentration followed by an overcompensation response, which leads to a re-establishment of homeostasis. A very good system to verify hormesis response in bees is the immune system. Therefore, we studied the immune system response of Apis mellifera scutellata in relationship to the insecticide thiamethoxam (THI). We assayed three THI groups in triplicate (N= 60 bees per group) with the concentration of THI as followed: 85.6ng/μL, 8.56ng/μL and 8.56ng/L offered ad libitum along 5 days and a control group. Surprisingly, the concentration that strongly stimulated the immune cells of bees was 8.56ng/L (p<0.01) and 8.56ng/μL (realistic dose) caused the higher mortality rate. But the hemocytes do not differ statistically from the control (about 3.000 hemocytes/mL). 85.6ng/L differed from control, increasing hemocyte number and presenting a marked decreased in mortality rate. Summarizing, concerning to mortality and hemocyte number, we had two hermetic curves: when we consider the mortality rate, the 8.56ng/μL dose caused higher mortality than the higher dose (85.6ng/L), which was similar to the control group. This fact can be explained because at this higher dose, the immune system was significantly activated in comparison to control. Using the number of immune cells as parameter of analysis we obtained a classical hormetic curve with the lowest dose (8.56ng/L) stimulating very strongly the immune system, which explains the smallest number of deaths of bees in relationship to others experimental groups. Xenobiotics can be present in the environment at low quantities, which are not detected by the most sensitive equipment or techniques, giving the impression that the contamination is essentially zero. The existence of hormesis for THI or its metabolites is a very alarming data for pollinator insects at ultra-low doses.

Biomarkers in Terrestrial Ecotoxicology: Stress Ecology in Bees

PT50. An old subject, but a new challenge in ecotoxicology applied to the study of morphological biomarkers in bees: Hormesis

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The assessment of the biological effects of low level exposure to chemical agents can obtain a paradoxal dose-response pattern, where can be observed a response called hormesis, which postulates that molecules can have a different response pattern from the traditional linear dose-response model at ultra low concentration. In hormesis there is a homeostasis disruption under ultra-low concentration followed by an overcompensation response, which leads to a re-establishment of homeostasis. A very good system to verify hormesis response in bees is the immune system. Therefore, we studied the immune system response of Apis mellifera scutellata in relationship to the insecticide thiamethoxam (THI). We assayed three THI groups in triplicate (N= 60 bees per group) with the concentration of THI as followed: 85.6ng/μL, 8.56ng/μL and 8.56ng/L offered ad libitum along 5 days and a control group. Surprisingly, the concentration that strongly stimulated the immune cells of bees was 8.56ng/L (p<0.01) and 8.56ng/μL (realistic dose) caused the higher mortality rate. But the hemocytes do not differ statistically from the control (about 3.000 hemocytes/mL). 85.6ng/L differed from control, increasing hemocyte number and presenting a marked decreased in mortality rate. Summarizing, concerning to mortality and hemocyte number, we had two hermetic curves: when we consider the mortality rate, the 8.56ng/μL dose caused higher mortality than the higher dose (85.6ng/L), which was similar to the control group. This fact can be explained because at this higher dose, the immune system was significantly activated in comparison to control. Using the number of immune cells as parameter of analysis we obtained a classical hormetic curve with the lowest dose (8.56ng/L) stimulating very strongly the immune system, which explains the smallest number of deaths of bees in relationship to others experimental groups. Xenobiotics can be present in the environment at low quantities, which are not detected by the most sensitive equipment or techniques, giving the impression that the contamination is essentially zero. The existence of hormesis for THI or its metabolites is a very alarming data for pollinator insects at ultra-low doses.
The permanence to a large part of metals paused as the Pb in the soil supone a amenaza para la salud humana y los ecosistemas. En los últimos años, esta preocupación ha incrementado, así como también los estudios de mecanismos de bioremediación a través de organismos bioindicadores. Los organismos bioindicadores se utilizan como indicadores directos del estado, estrés o cambios en el ecosistema. Eisenia fetida is an organism estándar used in ecotoxicology to terrestre por la Unión Europea y por la US-EPA. El objetivo de este trabajo fue evaluar los efectos del Pb en organismos bioindicadores como E.fetida expuestos a suelos contaminados. Se realizó a partir del monitoreo de las concentraciones de Pb, en el suelo y los organismos, y a través del estudio de las actividades metabólicas, durante determinados intervalos de tiempo. E. fetida (n=9) fueron expuestas a suelos experimentalmente contaminados con [Pb]=224.21 ppm durante 15, 30 y 60 días. Muestras controladas fueron consideradas organismos sin contaminar correspondientes al día 0. Los ensayos se realizaron por triplicado. La determinación de Pb en muestras de suelo y lombrices se realizó mediante espectrofotometría de absorción atómica. A partir de homogenatos de muestras controles y contaminadas se realizaron estudios en las actividades metabólicas como de glutatión-S-transferasa (GST), catalasa (CAT) y glutatión reducido (GSH), mediante espectrofotometría de absorción molecular. Se observaron diferencias significativas en la disminución de Pb en el suelo a medida que transcurría el tiempo del tratamiento. El mayor descenso de concentración del metal en el suelo ocurrió a los 15 días de tratamiento con 32% en comparación a la muestra control y al mismo tiempo, la mayor concentración de Pb en las lombrices con 240% superior a la concentración de la muestra control. Las actividades metabólicas (CAT, GSH y GST) de las lombrices contaminadas sufrieron modificaciones con respecto a las controles. Los resultados han demostrado que Eisenia fetida es un efectivo organismo bioindicator para la evaluación de la toxicidad del suelo, ya que son una herramienta sensible para su estudio.

PT53. Evaluation of cellular responses on bee organs exposed to xenobiotics by means of histological, histochemical and immuno-histochemical methods

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The honey bee Apis mellifera provides pollination services for diverse crop plants, and these services are at risk due to exposure of bees to xenobiotics. Forager honey bees collect nectar and pollen from flowers to sustain the colony and support healthy brood development; thus pesticides in the environment could potentially be transmitted to the hive through pollen and nectar contamination. Stressors from the environment, such as chemical compounds, may be harmful on cellular levels and/or affect the whole organism. In this way, the microscopy plays an important role as a good tool in the evaluation of cell markers that indicate adaptation or citotoxicity in response to xenobiotic. Morphological and histochemical methods in organs such as midgut, Malpighi tubules, fat body and others, such as HNS, are very important to diagnosis of harmful effects of pesticides on bees. In addition to these tools for morphological analysis, we used Laser Confocal Microscopy for labeling target proteins in tissue and organs of bees, which can modify in quantity and/or distribution in response to stress induced by xenobiotics, as well as DNA fragmentation (TUNEL method) to detect cell death triggered by them. The data about these biomarkers provided the following diagnostics for the analyzed organs: I) compensatory response: most of cells remain viable after intermediate level of damage and the cellular homeostasis is restorable after high level of Heat Shock Proteins (HSPs) and/or the enzyme superoxide dismutase (SOD) expressions; II) non-compensatory responses: most of cells undergo cell death by means of apoptosis, macroapoptohagy or necrosis after a high level of damage. These responses, at cellular level, can be used as effect biomarkers in studies that evaluate the morphological damages in bees exposed to sub-lethal concentrations of pesticides.

PT54. Fat body, pericardial cells and hemocytes in association with the myogenic region: a model system to analysis the stress e ecology in biomarkers of bees

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Bombus presents a serious global decline of populations and even losses of species. This complex and multifactorial phenomena is due increase of intensive agricultural activity and consequently indiscriminate use of agrochemicals, and a plethora of xenobiotics daily discharged in the environment. Therefore, it was tested this hypothesis on exposed workers of Bombus morio to different xenobiotics. The workers were kept in BOD (26°C, RH 70%, in the dark), fed ad libitum and divided into control (n = 20) and experiments (n = 20). For the first, we offered 2 mL of distilled water. For the experimental groups, 2mL of the exposition solutions were offered separately, as following: glyphosate 100 ppm and cadmium 1 ppb. We noticed that B. morio is very sensitive to the xenobiotics, even at realistic concentrations. In relationship to the control group, the glyphosphate-exposed bees showed trophocyte with signs of cell degeneration, but oenocytes morphologically intact. The pericardial cells presented in stages II and III, and lower incidence of hemocytes. Dorsal vessel was not damage. The cadmium-exposed bees showed the most harmful morphological changes. The fat body was totally damaged, the oenocytes presented typical cell death, whereas the trophocytes presented drastic reduction of size. In other cases, they presented sings of necrosis-like. conspicuous increase of activity the pericardial cells was observed, reaching the maximum stage of activity or stage IV. Some pericardial cell were under autophagy. It was observed high incidence of hemocytes between the myogenic region and the pericardial cells, and dorsal vessel vacuolation. The results showed that both xenobiotics affected the internal organs of bees in different ways. However, an integrated cellular response system in all groups was observed. To this system, we proposed the name of Hepato-Nephrotic System (HNS). The bee’s HNS can demonstrate that the bees presented different answers to xenobiotics, which indicates that the HNS not only is able to demonstrate the impact of the xenobiotics in bees, but also the differences of histo-physiological mechanism of them.

PT55. The consequences of the exposure to dimethoate in the metamorphosis of Africanized Aps mellifera

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The Aps mellifera bees play an important role in the pollination of agricultural ecosystems, and also in the Brazilian economy due to the marketing of apiculture products. Sublethal effects of pesticides may be directly or indirectly related to the observed decline of pollinators. In this sense, not only foraging workers should be evaluated, but also the other individuals that feed on nectar and pollen, including the larvae. Larval toxicological tests are already standardized by the Organisation for Economic Co-operation and Development (OECD) for the risk assessment of pesticides on bees. The insecticide dimethoate is used as the chemical reference/standard in toxicology bioassays with larvae. In this situation, this work was to evaluate the effect of dimethoate in pre-metamorphic phase of Africanized A. mellifera through acute exposure in toxicological tests. The analyzes were based on the evaluation of morphology, integrity and presence of different compounds in the fat body of pre-pupa (PP) resulting from larval bioassays using histological and histochemical analyzes. Toxicological tests were performed in Centro de Estudos de Insetos Sociais (CEIS), UNESP, Rio Claro, Brazil and morphological analysis in Laboratório de Biologia Estrutural e Funcional, UFSCar, Sorocaba, Brazil. Through morphological and histochemical analysis, intracellular spacing of trophocytes and oenocyte was observed, as well as an increase in the amount of proteins and lipids and nuclear branching in trophocytes. Most of these characteristics described are pupae, however the analyzed individuals were in the pre-pupa stage, therefore, it is likely that the dimethoate accelerates the development of bees. It could activate the cellular detoxification system by carboxylesterases enzymes and, in this way, cause the hydrolysis of the juvenile hormone and, consequently, the acceleration of the metamorphic phases. The advance from the present study calls attention to damage in the colony; one the other hand in nature the metamorphosis of the phases occur in its own time, development of possible physical change could indirectly damage the chain pollination accomplished by bees.

PT56. Toxicological and radiobiological parameters of Antarctic terrestrial environment (South Shetland Islands)

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Antarctica is the least-studied region of the Earth. The toxicology and radiobiology researches especially are scarce. This area is considered as the most pure and unaffected by human impact of the Earth, because of its remoteness and poor human presence. In the last two decades in Antarctica the human activity is much enhanced. This may explain the significant excess of the concentrations of lead and zinc in the environment, as the increased amount of cadmium. Along with this direct contamination in Antarctica are registered by the airflows anthropogenic radioactive elements after high-altitude nuclear tests and radiation incidents in the southern hemisphere. Radioactive elements and heavy metals are important environmental pollutants. They do not decay and they have long half-lives. Radioactive element's accumulation into living tissues leads to toxicity symptoms. They can participate in the food chain and poses a threat to the balance of this closed Antarctic system. We observed more then two and three times increase of the heavy metals concentrations about Cu and Zn for moss and lichens traced for a period of about 15 years in the same studied region. Comparison between Europe’s and Antarctica’s radionuclides quantity parameters was made. The values in the studied area are low for the radionuclides. Some of heavy metals parameters for Antarctica are higher than the European average (Cu in Antarctic moss is 11.40 mg/kg and 7.50 for Europe). From the results it can be assumed that the area is not heavily anthropogenic influenced. However detection of radionuclides and heavy metals in Bioconesos and biota of Livingston Island show that this considered the cleanest area of the Earth is affected directly and indirectly by human activity (Hristozova, 2015).

**Wednesday**

**Leading the way to the safe and sustainable use of pesticides**

PT57. Ecotoxicity of Mancozeb to Enchytraeus crypticus (Enchytraeidae) and Ensenia andrei (Oligochaeta) in two different Brazilian soils.

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The cultivation of apples has high representativeness in Brazilian south, where the the fungicide Mancozeb, forbidden in some countries in the world, is still applied. For pesticide registration in Brazil, earthworm’s lethality test is the only representative of soil fauna, not considering the effects of the products on other important species for soil processes. The aim of this study was to determine the toxicity of Mancozeb to Enchytraeidae (Enchytraeus crypticus) and earthworms (Ensenia andrei) in reproduction tests following ISO 11267 (2014), ISO 11268-1 and ISO 11268-2 (2012), in two representative soils for apple cultivation in Brazil – Oxisols (Latossolo and Nitossolo). The results for Enchytraeids were similar to Latossolo and Nitossolo in reproduction tests (EC50: 8.45 mg kg-1; EC50: 9.91 mg kg-1 (CI: 1.51 ± 16.31 mg kg-1 respectively). EC50 values were similar to reproduction and lethal effects in Latossolo (LC50: 6.97 mg kg-1 (CI: 2.58 ± 17.82 mg kg-1), however, high values of LC50 were found in Nitossolo (LC50: 232.95 mg kg-1). No acute toxicity was found to earthworms in both tested soils (LC50> 1000 mg kg1). Reproduction effects to earthworms were found in Latossolo, EC50: 576.36 mg kg-1 (CI: 343.11 ± 809.62 mg kg-1) and Nitossolo, EC50: 495.57 mg kg-1 (CI: 364.59 ± 626.56 mg kg-1). Results showed lower toxicity of Mancozeb to earthworms than to enchytraeids, and the low sensitivity of lethal tests in comparison to reproduction tests. This study reinforces the importance of sublethal endpoints in evaluation of pesticides, and remarks the use of Enchytraeid reproduction tests, which is already used in some countries as a representative of mesofauna soil in pesticides studies.

PT58. Toxicogenomics approach to unravel mechanisms of pesticide action in Folsomia candida: tools for environmental risk assessment

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This study aimed to investigate the mechanisms of toxicity behind pesticide contamination it is important to complement such information with responses at lower levels of biological organization. The “Omics” approach provides adequate and pillar techniques for such holistic understanding of the interaction of stressors with organisms. Folsomia candida is a common and widespread arthropod that has been extensively used as a “standard” test species for estimating the effects of pesticides and environmental pollutants, being very sensitive to organic compounds. The main aim of the present work was to address the mechanisms of toxicity of two pesticides, widely used in agriculture, on F. candida by trying to establish the link between the effects on reproduction with gene and protein expression patterns. For the assessment of survival and reproduction effects (ISO 11267:1999), the organisms were exposed to the herbicide glyphosate (30.8 % Montana®) and the fungicide chlorothalonil (38.8% Bravo®500) in a Portuguese agricultural soil. Organisms were then exposed to the reproduction EC50 of each pesticide (glyphosate: 4.95 mg a.i./kg; chlorothalonil: 127.31 mg a.i./kg), as well as to control conditions, and several time points were tested: 2, 4, 7 and 10 days. After protein extraction, each sample of control and pesticide-exposed organisms followed a shotgun proteomic approach based on liquid chromatography and tandem mass spectrometry (LC–MS/MS), combined with iTRAQ (isobaric tags for relative and absolute quantitation) labeling that allows comparative quantitative multiplex analysis. Different sets of differentially expressed proteins were identified, indicating the distinct biological and metabolic pathways that are being altered. RNA was also extracted and RT-qPCR was used to detect different sets of differentially expressed genes after exposure to each pesticide. Gene Ontology enrichment analysis identified distinct biological processes and molecular functions to be affected. Moreover, the pattern of gene and protein expression changed over time. This work constitutes the first attempt to understand the mechanisms of toxicity behind the effects of Mancozeb and Chlorothalonil in soil invertebrates which can be used to develop a more effective set of tools to assess the early effects of such pesticides in a real scenario of soil contamination.

PT59. A Risk Assessment Scheme to Assess Potential Side Effects of Pesticides to Honeybees

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Due to their activity as pollinators of various key crops, honeybees are an important part of agricultural ecosystems. In the scope of colony losses reported from some regions, there is currently an intensive discussion about factors potentially affecting bee health. One of these factors which is in the focus of the public discussion is pesticides. In the context of this debate, regulatory authorities of many countries are considering to revise their national assessment schemes to evaluate the safety of pesticides to bees. From the perspective of the crop protection industry, it is important that risk assessment systems are globally as consistent as possible. Moreover, they need to be protective and to be founded on a scientifically robust basis, but should be pragmatic and easy to handle. To provide support to regulators in this context, CropLife International bee experts have developed a risk assessment scheme for bees which fulfills the above criteria, and which we recommend for consideration to regulators who intend to revise their risk assessment system for bees. The system we are presenting is a refined scheme based on the principles of the EPPO 170 Approach which has been successfully used in Europe and has been shown to be protective. It is a tiered, hierarchical system which is relying on internationally validated study types. Protection goal of the scheme is the bee colony and its health and productivity. Foliar and soil-systemic uses are considered separately. The first-tier assessment is based on the Hazard Quotient Approach for foliar uses, one of the few empirically validated approaches in ecotoxicological risk assessment; for soil-systemic uses, a THIR approach is applied. Higher-tier assessment is essentially based on semi-field and field studies. These provide direct evidence in cases where the lower-tier assessment did not yield conclusive results, and include the option to consider local exposure scenarios in specific cases, e.g. in particular crops. For the bee-safe use of any kind of product, risk management is important as a measure to minimize exposure to a treatment; therefore risk management and risk mitigation is an integral part of the scheme: at any stage during the tiered risk assessment approach, it may be appropriate to consider risk mitigation measures.
Se evaluó en campos de soja los efectos de la aplicación del insecticida ENGEEO® (Lam: Lambdacoiotlina 0.66% p/v) Tia. Tianium 14-16, sobre Lepidópteros y Hymenoptéros. El muestreo se realizó 15 días antes y 2 y 4/5 días después de la aplicación del insecticida en tres lotes de soja de Bs. As. (L1, L2 y L3). Además se muestreó la reserva “El Destino” como sitio control. En todos los sitios y en las diferentes fechas se capturaron ranas y se tomaron muestras de suelos y agua. Se evaluó la condición corporal y biomarcadores de exposición a xenobióticos (ChE: colinesterasas y GST: glutatión-S-transf erase) de estrés oxidativo (CAT: catalasa y GSH: glutatión reducido). Las muestras de suelo y agua no contenían Tia ni Lam antes de la aplicación. Después de la aplicación, se detectó Engeo en el suelo de L2 (Tia 190 ppb, lam 231 ppb) pero no en los otros dos lotes, probablemente debido a la gran cobertura vegetal de estos sitios. La condición corporal de L. latinasus estuvo reducida con respecto al control en todos los lotes siendo significativa en L3. No hubo diferencias entre los sitios cultivados y control para L. latrans. H. pulchellus presentó un significativo aumento de la condición corporal. La actividad de ChE fue significativamente reducida dos días después de la aplicación para L. latinasus en L1 y L2 e H. pulchellus solo L2, recuperando sus niveles basales 4 días después. Lo mismo ocurre con CAT, dos días después de la aplicación, sus valores se reducen significativamente para L. latinasus en L1 y L2. Los niveles de actividad de GST fueron significativamente menores para L. latrans en L1 y L3 con respecto al control, tanto antes como después de la aplicación. Este trabajo es el segundo en reportar una inhibición de la GST en L. latrans de zonas agrícolas de la región pampeana. La mayor cantidad de alteraciones encontradas en L. latinasus podrían deberse a que es una especie exclusivamente terrestre, estando más expuesta a la aplicación de plaguicidas. En este estudio, se demuestra la importancia de muestrear inmediatamente después de la aplicación de este formulado.

PT62. Efficiency of Biobeds for pesticide disposal: Ecotoxicology evaluation using Collemmbola reproduction tests

L. Camargo, Soil Department; O. Filho; L.C. Filho, UDESC / Soil Department: L. Gheiler, Embrapa; J.C. Niemeyer, Universidade Federal de Santa Catarina

Pesticide waste disposal from washing the equipment consist in a source of contamination for agricultural soils. An alternative to this problem was founded in some countries: the discard is done in reactors filled with straw, peat and soil mixed, called Biobeds. In Brazil, this sort of effluent is not recommendable. In South of Brazil, Mancozeb and Chlorpyrifos are used in apple cultures, but their waste is discharge in soil and effects on soil organisms are unknown. An experiment with Biobeds was installed on the Experimental Station of Embrapa, at Vacaria City, in the apple harvest between 2013-2014, aiming to determine the toxicity into a biobed and in a local natural soil – Oxisol, during the harvest. The reactors were water boxes with biomix (Biobed) or Oxisol. The boxes received 50 L of effluent for each application in the crop. Samples of biomix and soils were collected on time 0 (without pesticide), 90, 150, 210 and 240 days after the first pesticide application, and ecotoxicity reproduction tests were conducted with Collembola (Folsomia candida) following ISO 11267 (2014). The number of juveniles for each treatment (Biomix or Oxisol) was compared for every time, with t-test. The collembolas not survive in any treatment for two first samplings. Only the last one(420 days) there was reproduction, and this not diverged statically from control, suggesting a toxicity reduction throughout time. Whereas, when compared Biomix against Oxisol, reproduction rates for the first one was upper than second. Although absence of toxicity in natural soil reactors after a period, in a natural system, discharge a substance which have an unknown toxicity and behavior, could impact soil organisms promoting a dissipation from that area, increasing the contamination already high, due lack of the pesticide dissipation. The study points to the need to know the toxicity of this waste, so common and generated in high amounts by agricultural activities and still without specific legislation in Brazil.

PT63. Assessing risk in the age of global trade: a comparison of regulatory bee requirements on plant protection products in South America, USA and Europe

M. Delgado, M. Faupel, A. Hoffarth, Rificon GmbH

Are the regulations governing the registration of plant protection products (PPPs) in developing countries just copied from their counterparts in the industrialized nations? Are the current and emerging agricultural world markets of the USA and the European Union? What about issues relevant to environmental, consumer and farmer protection in the countries of origin: are standards the same as in the USA or the EU? We take a closer look at the registration process of different regions across the globe (South America, U.S. and Europe). Taking the risk assessment of bees as the basis for a comparison, we identify the specific regional data requirements and risk assessment approaches for registration of PPPs. We then discuss the implications of South America’s eco-climatic variability and agricultural diversity with respect to the assessment of potential risk associated with PPPs on bees. Finally, we identify global trends in regulatory requirements and discuss the advantages and possible drawbacks of setting common approaches to evaluate risk and for streamlining the registration process.

PT64. Biomarkers of oxidative damage and its relationship with risk factors in a locality environmentally exposed to agrochemicals

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In Santa Fe province, located in the center of Argentina, has been historically one of the main agricultural centers. The production of the main crops (soybean, sunflower, corn, wheat and sorghum) significantly increased in recent years. The aim of this study was to evaluate oxidative damage generated by environmental exposure to agrochemical mixtures in people living in Santo Domingo, Santa Fe, Argentina and to compare them with healthy non-exposed people from Santa Fe city. The study involved 72 subjects, 44 from Santo Domingo (rural area) and 28 healthy donors from Santa Fe city (urban area). Samples were taken at two different moments, in September (low pesticide spraying) and in March (post-period of high spray). The activity of Catalase (CAT), Superoxide dismutase

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(SOD) and Thiobarbituric Acid Reactive Substances (TBARS) were analyzed. In addition, the results were analyzed in relation to the variables obtained from interviews (confounding factors and health events). The analysis of the surveys showed that mostly of the population live within 500 meters from the crops. Despite being a community closely linked with agricultural activities, they showed little knowledge about which pesticides are applied in the field area, which are the protections measures to be used by workers and the kind of problems that long-term exposure to pesticides can trigger. The results of oxidative biomarkers showed significant differences in TBARS and SOD between the group of people environmentally exposed to pesticides and the control group. A significant linear regression between TBARS with CAT and SOD was found. Data obtained with biomarkers were related to the agricultural labor activity as a confounding factor, showing to be significant for SOD. In turn, taking into account the period of application of pesticides, significant differences were found in the three biomarkers. The environmental exposure to pesticides was confirmed by measurements of atrazine residues in rainwater samples. This is a pioneer study to understand how organs are affected by exposure to persistent pollutants. A number of pollutants can modify epigenetic marks, thereby leading to changes in gene expression with the potential to cause adverse or adaptive responses. Furthermore, epigenetic changes can be maintained throughout a lifetime, and potentially beyond into subsequent generations, highlighting the concept of “epigenetic memory”. It is hypothesised that stress profiles may provide a marker to reflect early- or long-term exposures to stressors, and have utility as a novel tool for environmental monitoring. To explore these hypotheses, Daphnia magna were exposed for 14 days to sub-lethal concentrations of 5-acazuridine (a demethylating agent; 3.7 mg L⁻¹), arsenic (a carcinogen known to modulate the epigenome; 100 μg L⁻¹) and hypoxia (an environmental stressor; < 2 mg L⁻¹). Life-history traits revealed that the sustained exposure of daphnids to either 5-acazuridine or hypoxia caused a decrease in body size, while no effects were observed for arsenic. Whole-genome bisulphite sequencing (WGBS) was used to characterize the Daphnia magna methylome and to identify stress-specific DNA methylation profiles. In total, more than 2300 differentially methylated regions (DMR) were identified when comparing controls and treated Daphnia, and between treatments, with the majority of them being stress-specific. Further analysis is underway to annotate and identify the persistence of such changes. Epigenetic marks can add a new layer of information to the genome, however they can also be affected by the stressors, potentially causing long term effects. In summary, epigenetic changes have implications for risk assessment and also present a unique opportunity to use as a novel tool for environmental monitoring.

### PT65. Sharks as sentinels of ocean contamination: a multibiomarker approach
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Marine ecosystems are constantly being loaded with contaminants like persistent organic pollutants (POPs) and heavy metals. Quantification of pollutants can provide information about contamination levels in the environment, but may not be sufficient to understand how organisms are being affected. There is a need to link these measurements with biological endpoints, for example through the evaluation of enzymatic activities. Big pelagic apex predators, like the blue shark Prionace glauca, are particularly affected by pollution, mainly through bioaccumulation and biomagnification. Their huge distributions, along with their abundance and frequent capture by commercial fishing boats, make them potentially good species for use in biomonitoring studies. This study aimed to assess the potential of P. glauca as a sentinel species for pollution monitoring surveys, using biochemical biomarkers. Twenty blue sharks were sampled from the coast of Portugal, aboard a commercial swordfishing boat. Concentrations of both POPs and trace elements, as well the levels of biochemical parameters related with detoxification, oxidative stress, energy metabolism and neuronal functions, were assessed. As a first part of this study, the characterization of the cholinesterases (ChE) present in muscle and brain tissues of P. glauca was made to evaluate their potential for further biomonitoring studies. The results suggest that the Santos-Fernas protocol allowed to link imbalances in oxidative stress with two factors that could affect health. It would therefore be important to continue increasing the sample number, in this and other regional towns with similar characteristics. As well, addressing a perspective of environmental education that is currently lacking in the population.

### PT66. DNA methylation profile of Daphnia magna: novel perspectives for environmental monitoring and risk assessment
C. Gonçalves Almagristo, The University of Birmingham / School of Biosciences; L. Mirbahai, The University of Birmingham / School of Biosciences; M.R. Viant, University of Birmingham / School of Biosciences

Methylation of cytosine nucleotide plays an important role in the regulation and stability of gene expression, providing a cellular “memory” especially for long-term effects of pollutants on genes. As well, addressing a perspective of environmental education that is currently lacking in the population. Epigenetic marks can add a new layer of information to the genome, however they can also be affected by the stressors, potentially causing long term effects. In summary, epigenetic changes have implications for risk assessment and also present a unique opportunity to use as a novel tool for environmental monitoring.

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### PT67. Are WWTPs effluents responsible for acute toxicity? Seasonal variations of sediment quality at the Bay of Cádiz (SW, Spain).
L.A. Marango, UNESP (Universidade Estadual Paulista Júlio de Mesquita Filho) / Department of Chemistry and Physics; M. Garrido-Perez, CACYTMAR University of Cadiz; R. Buena-Nogueras, University of Cadiz / Physical Chemistry; P. Lara-Martin, Physical Chemistry; R. Antón-Martin, Universidad de Cádiz; T. DeValls, University of Cadiz / Department of Physical Chemistry; M. Martin-Díaz, University of Cádiz

Adverse effects of wastewater treatment plants (WWTPs) on sediment quality at the Bay of Cádiz (SW, Spain) were evaluated by a battery of acute bioassays and chemical contamination. Five sites directly affected by WWTPs effluents and one control site were chosen. Results evidenced clear deterioration of ecological sediment quality parameters and possible effects on aquatic communities towards WWTPs areas. Acute toxicity and chemical contamination varied significantly across the studied sites and differed between winter and summer seasons. The Bay of Cádiz is contaminated by PAHs, metals, detergents (SAS) and pharmaceutical products. Principal Component Analyses indicated metals, SAS and pharmaceutical products as the major environmental stresses. Sea-urchin embryo-larval and microalgae growth rate were the most sensitive bioassays to evaluate resuspension of contaminants (elutriate) from bulk sediment. Amphipods mortality and Microtox® Solid Phase Test (SPT) bioassays were recommended to evaluate bulk sediment quality. Therefore, the use of multiple bioassays, sensitive to sediment pollution, may provide complementary information to diagnose environmental factors that can impair aquatic communities. The battery of bioassays is recommended to assess and monitor marine sediments directly affected by a mixture of contaminants released from WWTPs.

### PT68. Biochemical responses and recovery of seahorse (Hippocampus reidi) after acute and subchronic exposure to water soluble fraction of diesel oil
F. Cañete Delamarido, Universidad de Vila velha / Applied Ichthyology Laboratory; L.C. Medeiros, Polytechnic Institute of Leiria / MARE IVEI; V. de Almeida e Val, National Institute for Amazonian Research / Laboratório de Ecologia e Evolução Molecular Leem; A. Val, Instituto Nacional de Pesquisas da Amazônia / Laboratório de Ecologia e Evolução Molecular Leem; A. Chippuri Gomes, Universidad de Vila velha / Applied Ichthyology Laboratory

The Evaluation of Effects of Pollutants Ecosystem Scale and Importance for Environmental Management - Part 1
The main goal of this study was to investigate the effects of acute (12, 24, 48 and 96h) and subchronic (168 and 360h) exposure to 50 % water soluble fraction (WSF) of diesel oil on the oxidative stress parameters and biotransformation enzymes in seahorse Hippocampus reidi (Ginsburg, 1933). In addition, we investigated the ability of fish to recover (504h without contamination) after 168h of exposure to the above WSF using the same biochemical approaches. Lipid peroxidation levels, antioxidant enzymes activities (GPx, SOD, CAT), concentration of reactive oxygen species (ROS) and thiobarbituric acid reactive substances (TBARS) were measured in the liver of 112 specimens (16 fish per condition/time: 8 for WSF exposure and 8 for its respective control group; and 16 for recovery experiment: 8 for post-exposure period and 8 for it control group). We observed that WSF of diesel oil exposure affected antioxidant defenses and phase II biotransformation enzymes in different ways. Significant increase of GST activity was observed at 360h of exposure, and LPO activity showed significant increase at 168 and 360h of exposure, when compared to their respective control groups. Catalase levels increased statically at 12h of exposure, while SOD was increased by WSF exposure at 12h and 360h compared to control groups. During recovery, only LPO levels were maintained at basal levels after 504h-post-exposure, when compared with 168h exposure group. Taken together, our finds indicate that WSF of diesel oil can trigger disturbance in the antioxidant defenses of H. reidi and the suite of selected biochemical assays can be considered as additional tools to determine the early impact of and recovery from acute and subchronic exposure caused by diesel oil contamination. Furthermore, H. reidi proved to be a useful biotestator in the determination of oil spill impact on fish populations. Financial support: FAPES, UVV.

PT69. Efectos de aguas contaminadas por ganadería, agricultura y minería sobre el desarrollo larval de Dendropsophus columbianus (Anura:Hylidae)

V.A. Ramírez, B. Toro, Universidad de Caldas / Caldas; L.F. Hurtado, Universidad de Caldas

Los anuros en sus estudios larvales incluyen respiración branquial e intercambio de compuestos a través del tegumento, convirtiéndolos en indicadores de la salud de los ecosistemas acuáticos. Por ello, se hicieron exposiciones crónicas con aguas contaminadas a larvas de D. colombianus obtenidas en laboratorio evaluando su crecimiento y desarrollo. Las aguas provenían de efluentes de una granja de ganado, de campos de cultivos y minas de carbón. Por cada tratamiento se hicieron cinco réplicas con un N=6 renacuajos. Se hizo un macerado híbrido de cada grupo y en todos se midieron tamaño, longitud de la cola, amplitud de la cabeza y peso. Se hicieron ANOVAS y pruebas de Dunnet para determinar diferencias en las medidas de las larvas entre tratamientos a los días 10, 20, 30 y 40. Se encontró que las larvas sometidas a la contaminación ganadera presentaron diferencias en la longitud de la cola (19,6 y 22,3 mm respectivamente, p< 0,05) frente al control. A su parte, el peso mostró diferencias en recauchos expuestos a minería con Hg y CN. Por cada tratamiento se hicieron cinco réplicas con un N=6 renacuajos en estadio 22 de metamorfosis para un total de 30 individuos por tratamiento. Se adaptó el test AMPHITOXO, alimentándose las larvas con 0.02 g de TetraMin macerado hasta el estadio 25, después se aumentó a 0.05 g suministrados en hojuelas. Cada cinco días se registraron los estadíos alcanzados en todas las larvas, posteriormente se seleccionó a un individuo al azar de cada réplica híbrida para medir la longitud de los rasgos morfológicos de longitud de cola, longitud de cabeza, longitud de cuerpo, amplitud de la cabeza y peso. Se hicieron ANOVAS y pruebas de Dunnet para determinar diferencias en las medidas de las larvas entre tratamientos a los días 10, 20, 30 y 40. Se encontró que las larvas sometidas a la contaminación ganadera presentaron diferencias en la longitud de la cola (19,6 y 22,3 mm respectivamente, p< 0,05) frente al control. A su parte, el peso mostró diferencias en recauchos expuestos a minería con Hg y CN respecto al control (0,3 y 0,4 g, p< 0,05). Se encontró que las larvas sometidas a contaminación minera alcanzaron el estadio 40 seis días antes que las del control. Los efectos por minería se reflejaron en una inhibición del crecimiento, estas diferencias en tamaño fueron compensadas por el incremento en la tasa de desarrollo, ya que los individuos sometidos a este impacto, sin importar su tamaño durante la exposición, sobrepasaron los estadios de metamorfosis que mostraron que microalgas expuestas a 100% de AP presentaron un bajo %ITC (100,11±13,93% p< 0,05), con diferencias significativas comparada con las concentraciones de 75% y 50%, en donde su %ITC fue mayor (-198,20±14,42 y -177,04±17,92%, respectivamente); además, se observó que el T5 (100% AP), presentó el mayor incremento en la densidad celular (3.560.000±181.040,8 cél/ml p< 0,05) cuando comparado con el control al finalizar el experimento, lo que podría asumirse como un efecto biorremediador de la microalga. La concentración de clorofila a se afectó por la exposición de AP, presentando diferencias significativas comparado con el control (p< 0,05) al finalizar el experimento. El diámetro celular en todas las concentraciones presentó diferencias significativas cuando comparado con el control (5,5±0,1 mm, p< 0,05), disminuyendo el diámetro celular medida que aumentaba la concentración de AP. Alteraciones en la actividad de la SOD y CAT fueron observadas en las microalgas expuestas al AP. Los resultados del presente estudio permiten evidenciar que C. vulgaris tuvo efecto biorremediador del agua de producción, a pesar que se observaron efectos potencialmente tóxicos.

Environmental Contaminants and Reproductive Effects

PT71. Evidences of Metabolic Disruptor Hypothesis: Perinatal Exposure to BPA Impairs Neuroendocrine Mechanisms Regulating Food Intake in Adult Male Rats.

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Obesity and metabolic syndrome are endocrine diseases and thus sensitive to environmental agents that can interfere with hormone and neuroendocrine action. Bisphenol A (BPA) is a compound used in the polymerization of polycarbonate plastics and is an endocrine disrupter (ED). Kisspeptin (kiss1), a hypothalamic neuropeptide that drives fertility by stimulating GnRH secretion, has been proposed to be the link between energy balance and reproductive function. We previously demonstrated that BPA impairs glucose, insulin and energy expenditure. Here, we evaluated the influence of perinatal exposure to a dose considered safe of BPA on hypothalamic signals that regulate food intake, both in adult males fed with control diet (CD) or a high fat diet (HFD). Male rats were exposed to 50 mg/kg/d of BPA or vehicle (0.002 % ethanol) from day 9 of gestation to day 204 of age. We evaluated kisspeptin (kiss1) and insulin as biomarkers of energy metabolism. Hypothalamic kiss1 was decreased in BPA-exposed rats compared to control group. We observed that WSF of diesel oil exposure presented a decrease in kiss1 mRNA expression in adult males fed with CD and HFD. A decrease in the activity of kiss1 receptor was observed in adult males fed with HFD. In adult males fed with control diet kiss1 receptor activity was lower than in adult males fed with HFD. Taken together, our findings indicate that WSF of diesel oil can trigger disturbance in the hypothalamic signals. These effects could be mediated by the down regulation of the neuropeptides: Kiss1, POMC, CART, AGRP, NPY; the receptors: ERb, ERa and its promoters (p< 0,05). Animals fed with HFD showed the same alterations plus the fall in body weight as a consequence of a higher energy intake. Here, we evaluated the influence of perinatal exposure to a dose considered safe of BPA on hypothalamic signals that regulate food intake, both in adult males fed with control diet (CD) or a high fat diet (HFD). Male rats were exposed to 50 mg/kg/d of BPA or vehicle (0.002 % ethanol) from day 9 of gestation to day 40 of age. We evaluated hypothalamic mRNA expression of the neuropeptides: Kiss1, POMC, CART, AGRP, NPY; the receptors: ERb, ERa and the relative activity of its promoters (OS, O, OT, and E1). In BPA exposed animals fed with CD, the higher energy intake was mediated by a down regulation of the neuropeptides CART, NPY, and the receptors ERb, ERa and its promoters (p< 0,05). Animals fed with HFD showed the same alterations plus the fall in body weight. Since weaning, males were fed with CD or HFD for 20 weeks. We evaluated hypothalamic mRNA expression of the neuropeptides: Kiss1, POMC, CART, AGRP, NPY; the receptors: ERb, ERa and the relative activity of its promoters (OS, O, OT, and E1). Perinatal exposure to BPA impairs glucose homeostasis, induces obesity and increases food intake in adult life of male rats altering hypothalamic signals. These effects could be mediated by the down regulation of ERa through a reduction of its promoters activity. BPA partially mimics the metabolic disruptor hypothesis proposes that kiss1 gene expression is involved in the control of energy expenditure. Si
PT72. Phytoestrogens in my lab animal diet! Withdrawal of phytoestrogens in adult life induces obesity and alters hypothalamic food intake control

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Phytoestrogens are nonsteroidal compounds found in many legumes and are particularly abundant in soy products. In almost all commercially available rodent diets, soy is used as a main source of protein. As a consequence, experimental animals have been bred and maintained for many generations on soy-containing feed, thus driving selection for traits that allow them to tolerate the relatively high levels of phytoestrogens present in commonly used commercial feeds. This fact focused our interest on the effects of a commercial diet as a relevant model of phytoestrogen intake, rather than exposing animals to pure phytoestrogens. Phytoestrogens have the capacity to bind both ERα and ERβ and to mimic estrogenic actions. Because both ERs are present in tissues responsible for the regulation of metabolism, the implication that phytoestrogens regulate metabolism appears plausible. Estrogens have been shown to influence body weight, food intake and adipose tissue deposition. Multiple studies have suggested that, similar to estrogens, dietary phytoestrogens play a beneficial role in reducing obesity and diabetes, and also removing phytoestrogens from rodent feed during pregnancy and lactation in CD-1 mice produces an obes phenotype in the litter and impairs glucose tolerance. On this basis, our lab focused on the effects of removing phytoestrogens from feed in the adulthood. Our study demonstrated for the first time that phytoestrogen withdrawal in the adult stage of life induces obesity in male rats. Energy intake was elevated involving an orexigenic hypothalamic response with reduced expression of anorectic neuropeptides and increased expression of orexigenic signals. Changing commercial animal chow by a low phytoestrogen diet modified endocrine homeostasis, reflecting a variety of physiological changes closely associated to obesity. One of the most remarkable alterations was the impairment of glucose homeostasis—a hallmark of insulin resistance and diabetes. Remarkably, the obese phenotype observed was more pronounced than in high fat fed animals, a model widely known to induce marked weight gain. The ubiquity of phytoestrogens in the diet of humans and laboratory animals emphasizes the necessity of further research in this field.

PT73. Milk composition and Bisphenol A exposure

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In most mammals, milk is the only food source for newborns and consequently, it must contain all the key nutrients for normal growth and development. In essence, milk is composed of milk proteins, milk fat globules, lactose, calcium and water. Its normal composition depends on the correct biochemical and structural differentiation of the alveolar cells. Environmental factors and the diet of the mother also affect milk composition. Therefore, any interference with the growth and differentiation of the mammary gland could impair the functional performance of the dam. Our studies evaluate whether Bisphenol A (BPA) modifies mammary gland differentiation and milk composition on perinatally exposed animals. BPA (0, 0.5 or 50 µg/kg bw/day) was administered in the drinking water of F0 rats from gestational day 9 (GD9) until weaning. After puberty, F1 females were bred and mammary gland samples were obtained at the end of pregnancy and during early-mid lactation. In addition, milk yield and milk protein and lipid/fatty acid (FA) composition were assessed. Serum levels of glucose, cholesterol and triglycerides were measured as well. On GD18, there was a decrease in α-lactalbumin and β-casein levels that were accompanied by reduced prolactin receptor and Stat5a/b expression. On GD21 and lactation day 2 (LD2), BPA exposure delayed mammary alveolar maturation and modified the synthesis of milk fat globules. Moreover, β-casein levels remained decreased not only in mammary gland, but also in milk samples and, BPA-exposed groups had an altered milk yield pattern during lactation. On LD10, mammary gland histarchitecture was restored and glucose, cholesterol and triglyceride serum levels were similar among groups. However, the milk of BPA-exposed F1 dams had a FA profile and lipid concentration different from those of the control one. BPA50 F1 dams produced milk with higher saturated FA concentration than BPA0.5 and control F1 animals. The increase in milk fat content and the differences in the milk FA profile exhibited by BPA50 F1 dams were associated with a higher body weight gain of the BPA50 F1 pups during lactation. Perinatal exposure to BPA has a profound impact on milk FA profile, impairing milk quality and compromising the normal growth of the offspring.

PT74. Metodo rapido con bajos límites de detección para la determinación diferencial eteres polibrominados (PBDEs) en leche materna por GC-MS/MS

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El descenso de la calidad de la leche materna es una preocupación mundial ya que su ingesta como alimento por los recién nacidos es indispensable para su desarrollo normal. Mucho esfuerzo se centra en la determinación de diversos contaminantes ambientales en leche materna debido a que proporciona un medio no sólo para evaluar la carga contaminante en las madres, sino también la exposición en los recién nacidos. Un nuevo enfoque analítico es presentado para la determinación de PBDEs en leche materna, que involucra menos tiempo y aplica los principios de química verde generando menos residuos químicos. El método QuEChERS con modificaciones fue usado como punto de partida. Una muestra de leche materna (10 ml) se colocó en un tubo de centrifuga, se fortificó con estándares internos marcados isotópicamente de 13C12-PBDEs que incluyen BDE-17, BDE-28, BDE-47, BDE-66, BDE-77, BDE-85, BDE-99, BDE-100, BDE-138, BDE-153, BDE-154, BDE-183, BDE-190 y BDE-209. La mezcla se agitó durante 1 min y se añadió 10 ml de n-hexano-acetona (1:1), se agitó con un vortex por un 1 min. Sulfato de magnesio (4 g) y cloruro de sodio (1 g) se adicionaron y se centrifugó a 4500 rpm (5 min). El extracto orgánico fue limpiado por extracción en fase sólida (SPE) con ODS (2 g) y Na2SO4 (1 g). Se eluyó con n-hexano (5 ml) y se concentra a 100 µl. Los extractos fueron inyectados en un cromatógrafo de gases acoplado a un espectrómetro de masas en tándem (GC-MS/MS), TQSM™ 8000 Evo Triple Quadrupole GC-MS/MS – Thermo Scientifc con una columna capilar de 5 % fenil)-metilpolisiloxano (15 m, 0.25 mm 0.1 µm de espesor de filme). Para garantizar la calidad y validar los resultados, se analizaron simultáneamente 10 blancos. La validación del método incluyó la determinado del límite de detección (<1 ppb), límite de cuantificación (< 2 ppb), rango de la línea de calibración (1- 500 ppb) y linealidad de la curva de calibración (R>0.995). En todos los casos los valores porcentaje de recuperación de los estándares internos marcados isotópicamente estuvieron por encima del 90%.

PT75. Decreases in the number and daily sperm production in the testes of Wistar rats exposed to polyamine putrescine

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Anthropogenic activities cause an exponential decrease in surface water quality, making them unviable for human consumption. Thus, a possible resource would be the exploitation of underground water, but such resources come under great impact by contamination coming mainly from cemeteries due to necrophoresis resulting from cadaverous putrefaction. This mixture is rich in chemicals, among which the diamine putrescine (C6H14N2), a polyamine which plays an important physiological role in processes of cell growth, differentiation and apoptosis. Current studies have shown continuous exposure to this substance may cause risks to human health. Thus, the aim of this study was to evaluate the effects of putrescine in sperm counts and daily sperm production of Wistar rat testes. We used 24 rats exposed to putrescine for 56 consecutive days, and arranged in three experimental groups treated with different concentrations (T1 - 46.3 mg/kg, T2 - 138.9 mg/kg, and T3 - 231.5 mg/kg) and a control group (drinking water). The testes were homogenized for sperm count in a Neubauer chamber, and the results were subjected to statistical analysis (ANOVA Tukey post-test, p < 0.05). The results show decrease in the sperm count is significantly and progressively with increasing concentration of treatment: T1 (151.1 ± 11.60), T2 (114.78 ± 17.32) and T3 (78.62 ± 3.60) compared to control (167.20 ± 57.73). The same is shown in daily sperm production (dsp) of T1 (24.77 ± 1.90) T2 (18.81 ± 2.83) and T3 (12.88 ± 0.59) compared to control (27.41 ± 6.34). Our results show a dose response effect, therefore stress the importance of studies with this compound in other organs in order to clarify their real mechanisms of action considering the negative effects observed in the testes.
PT76. Pre- and perinatal exposure to bisphenol A (BPA) modifies female and male mammary gland development.

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Endocrine disrupting chemicals (EDCs) have the potential to affect the development and differentiation of the mammary gland (MG). Bisphenol A (BPA) is an EDC that has been shown to elic its long-lasting and profound effects on rodent hormone-dependent tissues after the exposure had ended. Our hypothesis proposes that the exposure to low doses of BPA during the organogenesis and differentiation of the MG impacts negatively on its development promoting the action of chemical carcinogens. Our studies were designed to evaluate: a) the effects of prenatal or perinatal exposure to low doses of BPA on the MG of female and male offspring and b) whether the prenatal exposure to BPA increases the female MG susceptibility to the carcinogen N-nitroso-N-methylurea (NMU). Different time frames and exposition routes were assessed in Wistar rats. Pregnant rats received BPA either subcutaneously until parturition for the prenatal study or in the drinking water until weaning for the perinatal one. In both studies, male and female offspring was sacrificed at different ages and MG development was analyzed. Furthermore, after puberty a group of prenatal BPA-exposed females received a single subcutaneous dose of NMU and were sacrificed on adulthood. Male BPA-exposed animals showed a delayed mammary gland development, evidenced by a reduced ductal growth and decreased number of TEBs, independent of BPA route and length of the exposition. In female rats, prenat al exposure to BPA induced a deregulation between proliferation and apoptosis resulting in an increased number of hyperplastic ducts, an augmented stromal nuclear density and an altered endocrine environment with changes in the angiogenic process. Administration of NMU to animals exposed prenatally to BPA increased the percentage of hyperplastic ducts and induced the development of neoplastic lesions. In conclusion, our studies demonstrated that: 1) the male rat MG is sensitive to EDCs, being the prepubertal stage a useful time point to test for potential EDCs effects; 2) prenatal exposure to BPA increases the MG susceptibility to a chemical challenge; 3) BPA exposure induces modifications in the MG endocrine environment that are dose and time-specific; 4) assessing different administration routes, doses and lengths of exposure to EDCs is an important factor, since both the effects on the MG and the moment at which this effect can be appreciable could be different.

PT77. Mechanism of action of endocrine disruptors on human breast cancer cells and animal models

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Exposure to ubiquitous persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs) and hexachlorobenzene (HCB) has attracted concern in breast cancer etiology. Although the mechanistic actions of these chemicals in carcinogenesis remain unclear, studies have shown that some POPs have the potential to promote cancer development in various experimental models. These chemicals are endocrine-disrupting compounds, which interfere with the physiology of normal endocrine-regulated events and have two important characteristics make them different from many non-endocrine toxicants: low-dose effects and non-monotonic response curves. HCB is a widespread organochlorine pesticide found in maternal milk and in lipid foods. It is a dioxin-like compound and a weak ligand of the aryl hydrocarbon receptor (AhR). This receptor is a transcription factor that regulates gene expression associated with proliferation, angiogenesis, migration and invasion. HCB is a tumor co-carcinogen in rat mammary gland and an inducer of cell proliferation in MCF-7 positive estrogen receptor alpha (+ERa) human breast cancer cells. We have demonstrated that HCB stimulated c-Src/epidermal growth factor receptor (HER1)/STAT5 and HER1/ERK1/2 signaling pathways and cell migration in human breast cancer cell line MDA-MB-231 (ERa). Our previous studies using MDA-MB-231 show that HCB enhances metalloprotease-2 (MMP-2) expression, as well as cell invasion, through AhR and c-Src/HER1 pathways. Moreover, HCB increases MMP-9 expression, secretion and activity through a HER1 and AhR-dependent mechanism. HCB enhances subcutaneous tumor growth in MDA-MB-231 and C4-H1 in vivo breast cancer models in mice. Furthermore, HCB stimulates lung metastasis regardless the tumor hormone-receptor status. In a recent investigation, we found that HCB induces the angiogenic switch and increases vascular endothelial growth factor (VEGF) expression in a xenograft model. Human microvascular endothelial cells-1 (HMEC-1) exposed to HCB showed an increase in the expression of intercellular adhesion molecule-1 (ICAM-1) and VEGF receptor expression, as well as a decrease in hepatocyte growth factor receptor (HGF-R). In addition, we found that HCB activates VEGF-Receptor 2 (VEGFR2) downstream pathways p38 and ERK1/2. HCB induces cell migration and neovascularization in an AhR, COX-2 and VEGFR2-dependent manner. These results may help to explain the association between HCB exposure, angiogenesis and mammary carcinogenesis. Our findings suggest that HCB may be a risk factor for human breast cancer progression.

Urban Air Pollution: Predictive Models and Estimation of Emissions

PT79. Buenos Aires Air Pollution delay corneal wound healing

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Individuals living in areas with high concentrations of pollutants frequently report ocular symptoms. Clinical signs and histological changes of the ocular surface in face of exposure to ambient levels of air pollution have been documented. Usually, ophthalmologists do not regard air pollution as a possible cause of the afore mentioned alterations. Our group has demonstrated in previous studies that there is a correlation between ocular surfaces symptoms and signs and individual exposure to combustion-derived air pollution. The aim of this study was to evaluate the impact of exposure to Buenos Aires Ambient Air Pollution (AAP-BA) on the corneal wound healing reepithelialization in vivo. A corneal wound was performed on Balb/c mice. After that, they were divided into two racks, one received indoor air and the other received AAP-BA. At 0, 24, 48 and 72 hs after wounding, the wounded areas were stained with sodium fluorescein, photographed and each epithelial defect area was quantified and analyzed. Also, ocular washes were obtained at 1, 24, 48, 48, 55 and 72 hs to measure pro-inflammatory cytokines. Statistically significant decrease of wound healing was found for polluted group compared to control group. At 72 hs, 100% (13/13) of the control group wounds showed complete epithelial regeneration, while only 69% (9/13) of polluted group wounds were reepithelialized. Therefore, a secretion of TNF-a and IL-6 was detected on polluted group at 24, 28, 48, 55 and 72hs, while only a peak of TNF-a was detected on control group at 1hs. These
results confirm how urban air pollution can affect the wound healing of the ocular surface.

PT80. Impacts of atmospheric emissions on water turbidity from combustion of diesel S-500 and oxygenated fuel blends


Diesel is an important source of energy, but the increasing consumption of fossil fuels is concerning scientists to develop new options from renewable resources. Despite of the non-renewable origin of diesel, its combustion is highly impactful to the environment, inducing air, water and soil pollution. The addition of oxygenated compounds is an alternative to try to reduce the dangerous atmospheric emissions by the improvement of combustion process. The rate of CO and CO2 gases are directly related to the particulate matter formation, which could affect the water turbidity. Therefore, this study aims to evaluate the effects on CO, CO2 and turbidity from the gaseous emissions of burning blends with 4% (v/v) of n-butanol and 4% (v/v) of biodiesel with S-500 diesel. To develop the tests, a 4.2 CV stationary diesel engine was attached to an absorption column with ceramic fixed bed. The gases from the exhaust system of the engine were fed in the bottom of the column and the absorption water from a deionized column was fed on the top of the absorption column in a counter-current way. The engine was operated during 30 minutes. In the beginning of the test and at the end of this time, the measurement of CO and CO2 was made on the top of the column with the electronic system Optima 7 from Confor. After this final time, deionized water was supplied into the system with the engine still operating. The water from this process was used to check the turbidity with a bench turbidimeter. The biodiesel addition resulted at the beginning of the test 1994.5 ppm of CO and 950 ppm of CO2 and 814.5 ppm of CO and 10900 ppm of CO2 at the end. The turbidity at the end was 85.75 NTU. The addition of n-butanol resulted in 2549.5 ppm of CO and 600 ppm of CO2 in the beginning of the experiment and 588.5 ppm of CO and 9850 ppm of CO2 at the end. The turbidity at the end was 140.77 NTU. It is suggested that the initial concentration of CO in n-butanol blend accumulated into the absorption column, causing the higher turbidity. The final result of CO and CO2 from butanol blend is better than the biodiesel, but the initial result not. Further studies to evaluate this behavior must be made and it is suggested to analyze the toxicity of these gaseous emissions to understand the impacts for living organisms. Acknowledgements: FAP - Fundo de Apoio à Pesquisa da Univille. CNPq – Conselho Nacional de Desenvolvimento Científico e Tecnológico. Branco Motores.

PT81. Direct evidence linking systemic inflammation and altered cardiac function after an acute exposure to environmental particulate matter

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Epidemiological studies have shown a positive correlation between decreased air quality levels and adverse health effects. Increased cardiovascular morbidity and mortality rates have been found to be associated not only with chronic air pollution exposures, but also with short-term daily air pollution. In the complex nature of air pollution, and the coexistence of many compounds which may together contribute to the observed negative health impact, epidemiological data point out that particulate matter (PM) is the main responsible for the health outcomes. We have previously shown that an acute PM exposure leads to lung oxidative stress in mice, as well as to increased circulating proinflammatory markers and diverse negative effects over the cardiovascular system. Nevertheless, direct evidence unravelling the mechanism by which PM-induced systemic inflammation is associated with altered cardiac function is scarce. Therefore, the aim of this work was to analyze the cardioprotective effect of selective TNF-α targeting with a blocking anti-TNF-α antibody (Infliximab), in an in vivo mice model of acute exposure to residual oil fly ash (ROFA). Female Swiss mice were pretreated with Infliximab (10 mg/kg body weight i.p.), and were intranasally instilled with a ROFA suspension (1 mg/kg body weight). After 3 h, heart O2 consumption was assessed by high resolution respirometry in left ventricle tissue cubes, and ventricular contractile and lusitropic reserve were evaluated according to the Langendorff technique. ROFA exposure produced a 32% decrease in cardiac O2 consumption when compared to the control group (p<0.01). While ventricular contractile state and isovolumic relaxation were not altered in ROFA-exposed mice, impaired contractile and lusitropic reserve were observed in this group. Infliximab pretreatment significantly attenuated the decrease in heart O2 consumption, and prevented the decrease in ventricular contractile and lusitropic reserve in ROFA-exposed mice. Moreover, Infliximab-pretreated ROFA-exposed mice showed conserved LVDp and cardiac O2 consumption in response to a β-adrenergic stimulus with isoproterenol. These results provide direct evidence linking systemic inflammation and altered cardiac function following an acute exposure to environmental PM, and contribute to the understanding of PM-associated cardiovascular morbidity and mortality.

PT82. Urban air particles from Buenos Aires activates NFkB, MUC5AC and IL-8 production in A549 cells.

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Airborne particulate matter (PM) is one of the major air contaminants in the world and plays an important role in the occurrence of many diseases. Therefore, this study aims to evaluate the effects of PM exposure on the respiratory tract employing an in vivo animal model. We demonstrated that UAP-BA are ultrafine particles with no metallic traces able to generate lung inflammation and oxidative metabolism imbalance probably due to the high content of polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) adsorbed to its carbon core. However, the cellular mechanism involved in UAP-BA toxic effect hasn’t been studied yet. The objective of this work was to analyze in vitro human lung epithelial cells A549 signal transduction pathway after UAP-BA exposure. UAP-BA was collected using a Mini Vol sampler (1.8 L/min). A549 cells were exposed to 5 µg/ml UAP-BA for 4h and the following parameters were evaluated: IL-8 levels by ELISA; apoptosis by Hoechst staining; reactive oxygen species (ROS) by DHR123; reduced glutathione (GSH) levels by DTNB; Transcription factors: Nuclear Factor κB (NFkB), Nuclear factor (erythroid-derived 2)-like 2 (Nrf2) and mucin MUC5AC by immunohistochemistry; Heme Oxygenase-1 (HO-1), NAD(P)H dehydrogenase, quinone 1 (NQO1) and Nrf2 mRNA levels by real time PCR. Our results revealed that exposure to 5 µg/ml UAP-BA for 4h resulted in a 15% increase in ROS production, a decrease in GSH levels and no differences neither in Nrf2 nor in the HO-1 and NQO1 mRNA levels target genes. On the other hand, UAP-BA exposure activated NFkB and increased inflammatory proteins MUC5AC and IL-8. We conclude that the mechanism of the adverse effect of UAP-BA in human epithelial cell A549 involves NFkB activation, MUC5AC overexpression, and activation of pro-inflammatory NFBx which, in turn, could be responsible for the induction of inflammatory mediators like IL-8 and MUC5AC.

PT83. Characterization of PAHs, Particle Matter and Fira on Snow Pit Samples from Central Andes and Antarctica: Transport and Deposition Assessment

F. Cereceda-Bulic, P. Carmona, M. Funes, V. Vidal, Universidad Tecnica Federico Santa Maria / Centro de Tecnologías Ambientales CETAM

Atmospheric particulate matter (PM) as well as polycyclic aromatic hydrocarbons (PAHs) are important group of environmental pollutants that cause increasing global concern. PAHs investigation in different environmental matrices has been largely reported, however, information about their transport, deposition or accumulation on snow samples is sparse. Snow, as the main matrix in the cryosphere especially in mountain glaciers and Polar Regions, play an important role to investigate the distribution and concentration status of these pollutants in the Andes Mountain and Antarctic, as well as to provide some references about the long and global transportation of PAHs in the atmosphere. Snow samples were collected at Cerro Colorado (Central Andes), and northern Antarctic Peninsula (La Paloma Glacier (LPG)). Surface snow (firm) and snow pit samples were collected at all sites for determination of PAHs, but also for pH, electric conductivity, elements and ions. Extreme care was taken during sample collection, handling, transport, and analysis to assure sample integrity. Snow
samples were melted at room temperature, protected from light and filtered through quartz filter (Whatman QM-47) to separate particulate matter which was determined by gravimetry using analytical balance (0.01mg uncertainty). 16 EPA-PAHs were analyzed by HPLC-FLD. Firn results showed in CC samples a total concentration of (TPAHs) of 9.60 ng/L, were phenanthrene showed the highest concentration of all PAHs studied (3.70 ng/L). Northern Antarctic Peninsula LPG were the most impacted location with PAHs showed were TPAHs concentration was 14.20 ± 14.90 ng/L (n=3) were phenanthrene was also the highest concentration PAH (4.80 ng/L). This result can be due to the use of snowblows to reach sampling site, this hypothesis is sustained by the calculation of concentration ratio PYR/BAP which contain reference value for gasoline source apportionment. Snow pit samples in CC showed that maximum particles deposition were found between 66 and 90 cm depth which is coincident with maximum PAHs concentration (21.7 ng/L) found at same depth. LPG snow pit samples presented the same tendency with maximum particles deposition between 150 and 200 cm depth where maximum PAHs concentration of the whole snow pit were found (67.6 ng/L), indicating that PAHs deposition on snow is associated with particles deposition. Acknowledgments INACH Project RT-18-12 for their financial support.

**PT54. Particulate matter from Santiago, Chile, characteristics and sources. Contribution to public policy**


Atmospheric pollution in Santiago, Chile, has been for decades a priority to science and public policy, because of its adverse effects on public health and environment. Particulate matter (PM) and tropospheric O3 are the major pollutants. Since the early 70’s some groups of scientists, have analysed PM chemical, physical, and thermodynamic characteristics and their temporal and spatial variation. Public policies have focused since the mid 90’s in decreasing PM concentration to accomplish national standards and international recommendations. The implemented policy in this city, which expands constantly, has produced a reduction in annual concentrations of PM10 and PM2.5, without achieving a total adjustment to current regulations. Our hypothesis emphasize the idea that in order to achieve regulatory compliance and make it increasingly strict to prevent health problems, decisions should be based on the environmental, chemical, and biological variability of PM, not only mass and size. In this work, results of fractionated PM collected during November of 2013 are presented. Samplers were located in the North Campus of the University of Chile (a Gent SFU Sampler for PM2 and PM10 and a Partisol sampler for PM2.5), at 100m east of the city monitoring station (TEOM samplers for continuous concentrations of PM2.5 and PM10). Sampling periods were daytime (05-21h) and night-time (21-05h). Elemental composition was determined using multi-elemental non-destructive techniques: PXE and INAA. Results show that the 24-hconcentrations for PM2.5 and PM10 values did not exceed the national standard, instead the annual values exceeded 25% and 75%, of the opportunities, respectively, thus contributing negatively to the annual average. In addition to elemental analyses, backward air trajectories and statistical tools allowed the identification of potential local and/or regional sources. For example, in the night-time possible contributions of S from sources located more than 100km south were identified together with local sources related to the emissions of Cu, V, Fe and K. This information could be relevant when designing new tactics and strategies to decrease emission from sources of atmospheric pollution.

**PT55. Local estimations of PM10 in the communes of Recoleta and Vitacura, Santiago, Chile. Contribution to the polities to decrease vehicular congestion**

D. Muñoz, Universidad de Chile / Orgánica y fisicoquímica; R. Fuentesalba Poblete, M. Prédence, Universidad de Chile / Química Orgánica y Fisicoquímica.

Air pollution is a major problem worldwide, involving damage to human and environmental health. Particulate matter (PM) due to its complex physical and chemical nature has been more frequently studied and regulated; the fraction having aerodynamic diameter ≤ 10 µm (PM10) is called breathable, because penetrates to different depths of the respiratory system; the so called “fine fraction” corresponding to ≤ 2.5 µm (PM2.5) is 100% breathable and can be deposited in the alveoli, causing respiratory diseases like as pneumonia. In Santiago, Chile, the regulations for PM10 and PM2.5 are exceeded many times during autumn-winter period. Even if 1998 different strategies has contributed to decrease concentrations, the problem still exists in many communes of the city. Respiratory diseases are the third leading cause of death in Chilean population, with the “community-acquired pneumonia”, as one of the few medical conditions with high levels of lethality that should be declared an epidemiological problem. In Chile, one of the reasons for long hospitalization of patients is due to the inevitability contact with a precursor source of disease, air pollution. Several countries have regulations regarding the location of health services avoiding its proximity to areas of high traffic flow, industrial influence, cemeteries, morgues, cemeteries, markets or grocery stores and, in general to sources of pollution and insecurity. It is not the case of Chile. Air pollution have many sources. In Santiago motor vehicles is one of the most important. Motor vehicles simultaneously release to the atmosphere magnetic particles and PM. Numerous studies have concluded that this PM shows a high correlation between PM10 concentrations and in situ measurements using the technique of saturation isothermal remanent magnetic (SIRM), which provides maps of high spatial resolution and potentially accounting for the traffic flow on where the analysis is performed. In this paper we show spatial maps for street soils collected in two communes of Santiago; results allowed a local estimate of pollution levels and traffic, in the proximities of health services. This is a valuable information that could help to generate vehicular decongestion measures and optimization of regulatory plans avoiding excessive traffic in places where air quality has a critical role in human health.

**Metal Session**

**PT86. Trace Metals. Relevance of bioavailability to biological response and risk**

A. Fernandez-Cirelli, University of Buenos Aires

Although metals have become increasing important as a pollutant group, only during the last four decades or so they have been widely acknowledged as potentially environment toxins. Trace elements may be grouped into three categories according to their biological and chemical reactivities. The United States Environmental Protection Agency (USEPA) included 13 metals in their priority pollutant list. Their natural origins are contrasted with their more diverse anthropogenic sources. Bioavailability is the potential of living organisms to uptake chemicals from the food or from the abiotic environment to the extent that the chemicals may become involved in the metabolism of the organism. Chemical measures of contaminant concentration does not always reflect the bioavailable fraction. Bioavailability is the key driver defining the extent and magnitude of biological responses. Biotoxicity can be induced directly on organisms through direct exposure to the toxic chemicals or somewhat indirectly through indirect exposure to the chemicals. Transference of toxic trace elements from abiotic matrix to the food chain is dependent on bioavailability and should be taken into account for risk assessment.

**PT87. Using spatially explicit data and population modeling to inform ecological risk assessment at mining sites**


The ecological effects of mine development are typically assessed using very conservative assumptions inherent in screening level ecological risk assessments (SLERA). vis-à-vis toxicity and exposure estimates. We recommend a simple efficient SLERA followed by a focused population-level risk assessment designed by risk assessors in consultation with mine planners and geochemists. We provide an example of an evaluation of potential risk using spatially explicit modeled data and empirical site data for multiple media including soil and expected future sediment and surface water conditions at a mining site. These
data were used in conjunction with an expanded list of toxicity values and exposure pathway models to evaluate risks to ecological receptors at the site. Results indicate a handful of metals of potential concern based on exceedances of low-effect criteria for bats, barn swallow, and spotted sandpiper. In an effort to focus risk management, a third-tier risk assessment was conducted using an individual-based model (IBM) to evaluate uncertainties in the risk assessment approach and to provide population-level impacts for the bat Myotis sp., as an example species. This population modeling effort expands upon the exposure scenarios and anticipated future site habitats used to evaluate both baseline risks and potential mitigation of risks by overlaying material to reduce exposure to areas with higher levels of chemicals of interest. The results demonstrate the usefulness of population modeling tools in assessing future exposure scenarios to meet risk management objectives in the real-world currency of natural resources (i.e., population abundance) as opposed to the pass/fail hazard-quotient paradigm currently utilized in risk assessment. This study also illustrates the importance, even at a screening level, of a robust, spatially explicit site-specific data set in understanding future conditions and site management alternatives.

PT88. Stable isotopes and metallothioneins as tools for the evaluation of metal contamination
T.G. Seixas, ENSPFOCRUZ / Departamento de Endemias Samuel Pessoa; H.A. Kehrig, Federal University of Rio de Janeiro / Lab de Ciências Ambientais; R.A. Hauser-Davis, Biodiversity PostGraduate Program
Currently, stable isotopes and metallothionein are tools for understanding the behavior of metals in the worldwide environment. Some isotopes, such as carbon, nitrogen, oxygen, hydrogen, and sulfur have been used for many purposes in different types of environmental studies. Stable isotope measurements have provided useful data on a trophic ecology, indicating the food assimilated from feeding activities and food sources. In general, stable isotope ratios of a consumer are related to those of their prey and consumers that occupy the same trophic position have similar isotopic measurements. In trophic ecology approaches, stable isotope of nitrogen (δ15N) has been mainly used to recognize different trophic levels and food assimilation over time, while carbon (δ13C) indicates different dietary-based carbon sources (e.g. inshore vs. offshore, pelagic vs. benthic or aquatic vs. terrestrial). The analytical technique used in the analysis of stable isotopes of the elements is isotope ratio mass spectrometry (IRMS), in which the sample is analyzed against a specific international standard for each element, with an analytical error of the order of 0.2. Furthermore, the enrichment values δ15N may also be used to evaluate the processes of metal biotransference and biomagnification through the aquatic food webs. Another tool that assists in the evaluation of water contamination by metals is the analysis of metallothionein concentrations in aquatic organisms. Metallothioneins (MT) are cysteine-rich low-molecular-weight proteins that bind with high affinity to trace-elements and whose expression is mainly induced in response to the presence of certain trace-elements, such as Hg, Cd, and Pb. MT determinations in biota tissues have been used as a biomarker of previous exposure to a number of trace-elements, since MT levels correlate well with environmental levels. Thus, significant correlations between these proteins and metals in detoxification organs such as the liver are usually observed. MT determinations can also be determined by biochemical analytical methods, such as spectrophotometry. However, for environmental analyses, which usually involve numerous samples, a simple, efficient and inexpensive method is usually preferred. Thus, spectrophotometry is suitable for investigating differences in environmental samples differentially exposed to metals, being quick, easy accessible, and inexpensive. The presentation will consider only recent studies developed by the authors.

PT90. Development and evaluation of hollow fiber supported liquid membrane devices for the measurement of bioavailability of toxic metal ions
F. Rodríguez de San Miguel, Universidad Nacional Autónoma de México / Analytical Chemistry; E.A. Rodríguez-Morales, J. de Gyes, Universidad Nacional Autónoma de México
Preconcentration and speciation devices based on hollow fiber supported liquid membranes (HFSLM) were development for the passive sampling of metal ions. Metal contents within the acceptor solutions were measured using atomic absorption spectrometry. The influence of variables related to module configuration and to the sample properties were optimized through experimental design strategies to attain maximum preconcentration factors and minimum depletion. Then a comparison of content-based environmental bioavailability as measured using the HFSLM device, as chemical surrogate, and two microalgae species was performed under several experimental conditions (pH, organic matter, inorganic anions, and coconmitant cations). Results indicated a significant positive correlation when comparing the bioavailability results measured by the HFSLM and the biological entities which strongly depends on the type of metal ion and the microalgae species employed as reference.

PT91. Using Environmental Quality Indices to assess heavy metal contamination at Baixada Santista, Southeastern Brazil
B. Kim, University of Sao Paulo / USP / Instituto Oceanoográfico Departamento de Física; A. Barbosa Salaroli, J. Rosenberg Sartoretto, University of São Paulo; R.C. Figueiro, University of São Paulo / USP / Departamento Oceanoográfica Física Química e Geológica
The Baixada Santista hosts the largest harbor of South America and the biggest industrial pole of Brazil. The harbor influence, Cubatão City and the urbanization are responsible for heavy metals releases, which contribute to the contamination of the estuarine system as a whole. Environmental Quality indices are powerful tools used to evaluate degradation level of a system and they also provide a single highly visual data presentation which can be explained to and understood by non-scientists. Facing this issue, this study proposes to use different kinds of Environmental Quality Indices to evaluate levels of metals in superficial sediments of Santos Upper Estuary and Bertioga Channel. Thus, superficial sediment samples were subjected to an acid digestion and quantified (Al, As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, Sc, V and Zn) by ICP-OES. Indexes such as Enrichment Factors, Sediment Pollution Index and Pollution Load Index were applied to evaluate the sediment quality. In general, the indices indicated absence of contamination (SPI < 2; PLI < 1) and Enrichment Factor with moderate enrichment (2 ≤ EF ≤ 5). Arsenic and lead had higher enrichment probably due to natural processes of weathering and sedimentation, and influence of industrial effluents and dumps. The gathered analysis of metal levels with the proposed indices indicated that there is not a concern dealing with metal contamination, even with all the stress that the system undergoes such as industrial activity, urbanization and harbor influence.

PT92. Speciation of Lead (Pb) in Tailings of Hidalgo de Parral, Chihuahua, Mexico.
I. Gavilan, UNAM / Organic; A. Panchaca, Facultad de Química UNAM; R. Rosiles, UNAM; s. cano.
In Hidalgo del Parral, Mexico, there is a problem for two large environmental liabilities: one is produced by oil activities and the other by mining companies; these mining companies provide an important contribution to the national economy of the capital but in turn, metallurgical processes produce excess pollutants into the environment, which may contain heavy metals that cannot be
PT93. Screening of plants and mejoradores de sustrato para revegetación de sitios impactados por minería

S. Cambre, Katholieke Universiteit Leuven; E.E. Smolders, Katholieke Universiteit Leuven / Division Soil and Water Management; C.G. Oporto, Universidad Mayor de San Simon / Centro de Aguas y Saneamiento Ambiental

La fitostabilización de suelos impactados por minería es una alternativa de remediación sostenible y de bajo costo. El objetivo de este estudio fue realizar un screening de plantas y mejoradores de sustrato, adecuados para la revegetación de pasivos mineros en Bolivia. El sustrato seleccionado es acido y bajo en nutrientes. La concentración de cadmio, entre otros MPPs, es toxica para las plantas. Se realizaron 3 experimentos con el sustrato en macetas, y 1 experimento en solución de cultivo. Como mejoradores de sustrato se probaron: abonos orgánicos (compost A y B), fertilizantes inorgánicos y caliza. Se testearon 4 especies nativas (F. orthophylla, V. pazensis, T. amabile, C. bursa-pastoris), y una no nativa (H. vulgare). Se asumió que la fitotoxicidad del Cd sería el principal factor limitante del crecimiento. El experimento en solución revelo que la tolerancia al Cd sigue la secuencia F. orthophylla >H. vulgare >T. amabile >V. pazensis y permitió identificar la concentración de Cd en los tallos de H. vulgare a la cual el crecimiento es reducido al 50%. El 1º experimento en macetas donde se incrementó un poco la CIC con compost A, resultó en crecimiento marginal de F. orthophylla y V. pazensis, las otras especies no progresaron. En el 2º experimento con compost B, caliza y fertilizantes inorgánicos, se observaron los efectos significativos de la materia orgánica y el incremento del pH sobre el crecimiento de las plantas. La concentración de Cd en las plantas de los experimentos 1 y 2 excedió los niveles críticos, esto se puede atribuir también a la falta de un efecto de dilución por crecimiento. En el 3º experimento con suelo, la adición de turba y caliza incremento el crecimiento por un factor de 4. El análisis de los tallos sugirió que el Cd no explica los efectos del fertizilizante ni de la caliza, ya que la concentración de Cd se mantuvo por debajo del límite crítico. El análisis de la solución de suelo de los experimentos en macetas sugirió que el Cd puede ser un factor limitante para las especies más sensibles V. pazensis, pero no para F. orthophylla y H. vulgare. La deficiencia de nutrientes mas que la toxicidad del Cd es probablemente el factor limitante del crecimiento.

The Evaluation of Effects of Pollutants Ecosystem Scale and Importance for Environmental Management - Part 2

PT94. Concentración de metales pesados mercurio, cadmio, plomo y arsénico en algunos recursos pesqueros del Caribe Colombiano

S.E. Gallego Rios, Universidad de Antioquia / Antioquia; C.M. Ramirez Botero, Universidad de Antioquia

Este estudio se realizó para proporcionar información sobre las concentraciones de metales pesados en músculo de ocho especies comerciales de peces presentes en el Caribe Colombiano con el fin de conocer las concentraciones existentes en las diferentes especies. Se midieron las concentraciones de mercurio (Hg), cadmio (Cd), plomo (Pb) y arsénico(As), en músculo de Róbalo (Centropomus sp), Jurel (Caranx hippos), Sierra (Scomberomorus cavalla), Pargo (Lutjanus sp), Pargo (Lutjanus sp) y T. amabile. Los niveles de metales pesados se determinaron por Espectrometría de emisión atómica de plasma inducido por microondas después de una digestión acida. Los resultados indicaron grandes variaciones entre los niveles de metales pesados de las ocho especies de peces analizados. Se detectaron niveles altos de Pb en todas las especies; siendo las especies Caranx hippos y T. amabile las que más niveles de Hg acumularon en músculo. Las concentraciones de metales pesados que se encontraron en músculo variaron para Hg: 0.050 – 5.601, Pb: 0.632 - 4.495 mg/kg de peso húmedo. Los niveles estimados para el cadmio y el arsénico del presente estudio fueron inferiores a los límites permitidos por la Organización para la Agricultura y la Alimentación de la Organización / Mundial de la Salud de las Naciones Unidas (FAO / OMS) y el Ministerio de Salud y Protección Social de Colombia. Sin embargo para el mercurio y el plomo las concentraciones excedieron los límites permisibles en el pescado propuestas (FAO / OMS) y el Ministerio de Salud y Protección Social de Colombia en algunas de las especies comerciales, lo que afecta la salud humana por causar alteraciones en el sistema nervioso, renal, óseo, pulmonar y cardiovascular debido a su elevada toxicidad.
Afterwards, the medium separated from the precipitated microalga and their toxicity was tested exposing for 24h D. magna neonates. The precipitated microalga did not reduce survival and only delayed the age at first reproduction at 1µg/L of fenvalerate in the high density treatment. In the medium fraction, survival was reduced at 1µg/L of fenvalerate only in the low density treatment.

The age at first reproduction was delayed at 0.3 and 0.6µg/L in the low and intermediate treatments, respectively. These results agree with the decrease of the actual concentrations of fenvalerate after the microalga precipitation that reached 62% in the high microalga concentration. If these findings are validated for other toxicants the influence of food conditions on the toxicity of hydrophobic pesticides should revaluated from a different perspective.

PT99. **Wildlife Toxicology in Latin America: are we addressing the effects of pollutants at the ecosystem level?**
M.A. Moro, Texas A&M University / Wildlife and Fisheries Sciences

It’s been almost 20 years since the journal environmental toxicology and chemistry published a special issue in tropical ecotoxicology status and trends. In this issue it was stated that very little research in ecotoxicology had been carried out in tropical environments. This study also pointed out that there was a lack of understanding of the impacts of chemicals on wildlife in large-scale agricultural activities, including banana, pineapple, soybean farming, and gold mining. Interestingly, this publication came out at the same time that a review on Persistent organochlorine pesticides in migrant birds of the Southwestern United States and Mexico was published also in ET&C. Nearly 20 years later, the issue regarding a lack of understanding of the impacts of chemicals on wildlife and studies in the field of wildlife ecotoxicology in Latin America remain almost the same. This presentation provides a review of advances in the field of wildlife toxicology in Latin America in the last 20 years and highlights gaps and needs in terms of studies on pollutants of potential concern and their impacts on biodiversity and wildlife in Latin America.

**Ecological Risk Assessment of Pharmaceuticals and Personal Care Products (PPCPs) in Aquatic Environments**

**PT100. Emerging Contaminants of Concern (CECs): From Wastewater to Vegetables**
J. Gan, University of California, Riverside / Department of Environmental Science

To address water scarcity, municipal treated wastewater is increasingly used as a valuable water resource in agricultural irrigation in many parts of the world. Treated wastewater contains numerous so-called contaminants of emerging concern (CECs), including bisphenols, steroids, and pharmaceutical and personal care products. Many CECs can cause adverse ecotoxicological effects at environmentally relevant levels. However, their potential for accumulation into food crops such as vegetables and the subsequent human exposure is poorly understood. We have carried out greenhouse and field studies to evaluate uptake of common CECs into vegetables. Plant uptake was closely related to the environmental concentrations of CECs in treated wastewater. Plant uptake was closely related to the environmental concentrations of CECs in treated wastewater. Peroxidation-driven transport via xylems. Under field conditions, 9 out of 20 PPCPs were frequently detected in edible parts of vegetables. However, the overall accumulation was low, with the total concentrations ranging 0.01–7.3 µg/g. These levels would translate to smaller than 0.1% of a single medical dose from the consumption of these vegetables for an entire year, suggesting a limited risk from dietary uptake of vegetables irrigated with treated wastewater. This presentation will provide an overview of occurrence of CECs in treated wastewater, adverse ecological effects of CECs, accumulation into plants, and future research needs.

**PT101. Subchronic exposure to diclofenac alters antioxidant enzymes in kidney and blood plasma of Rhamdia quelen**
J.L. Ribas, Federal University of Pararã / Pharmacology; I.C. Gualosi, Universidade Federal do Pararã / Farmacologia; F. Mathias; D.B. Simmons, Environment Canada / Aquatic Contaminants Research Division Department of Biology; J.P. Sherry, Environment Canada / Water Science Technology Directorate; H. Silva de Assis, UFFR / Pharmacology
Drugs for human and veterinary use can have negative effects on the aquatic biota. In the present study, the effects of exposure to diclofenac on biochemical biomarkers in Rhamdia quelen were evaluated. Juvenile male (20) and female (20) fish were exposed to 3 concentrations (0.2, 2 and 20µg/L) of Diclofenac. One third of the water volume in each tank was replaced twice daily in order to maintain the diclofenac concentration. After 14 days of exposure, the fish were anesthetized, blood was taken from the caudal vein, and the kidney was removed. The activity of biochemical Biomarkers were measured in the kidney. The expressed proteome was analyzed in the blood plasma. The biochemical biomarkers included superoxide dismutase (Sod), catalase (Cat), glutathione peroxidase (Gpx), glutathione S-transferase (Gst), the concentration of glutathione (GSH) and lipoperoxidation (LPO). The plasma proteome was analyzed by liquid chromatography tandem mass spectrometry. The exposure of Rhamdia quelen to diclofenac increased the Sod and Gpx activities at all concentrations and Gst activity at 0.2 µg/L in kidney. However, LPO was reduced by diclofenac at 2µg/L. In plasma many proteins related to kidney damage were changed. In male fish there was an increase in the Complement Factor B (Cfb), Tumor necrosis factor (Tnf) receptor superfamily-Fas protein and Toll like receptor 9 in all groups diclofenac-exposed. There was also increased expression of 5-phase Kinase associated protein 2 (e3 ubiquitin protein ligase) (Skp2) (0.2 and 2.0µg/L) and growth arrest and dna-damage-inducible gama protein – (Gadd45g) (2.0µg/L). The expression of Nitric Oxide Synthase (iNOS), Fibrinilin 1 (Fn1), Integrin alpha 1 (Iga1) and Cytochromeoxidase Class I (Cox1) was decreased in all groups. Decreased expression also occurred in Hemoglobin Alpha 1 (Hba1) (2.0 and 20.0ug/L). Female fish showed a decreased expression in Cfb, Fas, Fn1, Cox1, Skp2 and Gadd45g proteins. In addition, increased expression of Matrix Metalloproteinase 2 (Mmp2), Phosphodiesterase 5a (Cgmp-specific-Pde5a) and Hb1. These changes can be linked to morphological injury in kidney, glomerulonephritis, interstitial fibrosis, renal failure, renal vasodilators with influence in glomerular hemodynamics and renal perfusion. Overall, our results suggest that exposure of fish to diclofenac impacted biochemical markers and also modulated the expression of plasma proteins.

PT102. Environmental risk assessment of pharmaceuticals and personal care products in Santos Bay, São Paulo, Brazil

F. Pascudda, Laboratório de Ecotoxicologia / Laboratório de Ecotoxicología; R. Brasil Choueri, UNIFESP / Ciencias do Mar; A. Cesar, Universidade Federal de São Paulo; D.R. Santos, F.J. Castro, Universidade de São Paulo; C. Seabra, São Paulo Federal University / Marine Science; F.S. Cortez, A.R. Santos, Universidade Santa Cecília / Laboratorio de Ecotoxicología; J.R. Rogero, Universidade de São Paulo / Instituto de Pesquisas Energéticas e Nucleares.

There is little information about the adverse effects of emerging compounds on the tropical and subtropical marine biota, especially regarding contaminated sediments. The aim of this study was to assess the environmental risk of ibuprofen, 17α-ethinylestradiol and triclosan to marine invertebrates exposed to contaminated sediments. Environmental levels of these compounds were measured in a sediment sample from the vicinities of the Santos submarine sewage outfall (Bay of Santos, São Paulo, Brazil). Ibuprofen (49.0 ng g⁻¹) and triclosan (0.8 ng g⁻¹), while 17α-ethinylestradiol was not (< 33.3 ng g⁻¹). A battery (n=3) of chronic bioassays (embryo-larval development) with sea urchin (Lytechinus variegatus) and bivalve (Perna perna) was performed using ibuprofen, 17α-ethinylestradiol or triclosan spiked sediments in concentrations ranging from 1 to 1,000 ng g⁻¹. All compounds showed developmental effects to both test species. Chemical and ecotoxicological data were integrated and the quotient risk estimated for ibuprofen and triclosan showed values higher than 1.0, indicating high environmental risks of this compounds in the Santos Bay. These are the first data of risk assessment of pharmaceuticals and personal care products in sediments of a Brazilian coastal area.

PT103. Cytotoxicity of triclosan and 17α-ethinylestradiol spiked sediments to marine bivalve

F. Pascudda, Laboratório de Ecotoxicologia / Laboratório de Ecotoxicología; A. Cesar, Universidade Federal de São Paulo; B.B. Moreno, Universidade Santa Cecilia; S.O. Rogero, Universidade de Sao Paulo / Instituto de Pesquisas Energéticas e Nucleares; C. Seabra, São Paulo Federal University / Marine Science; F.S. Cortez, A.R. Santos, Universidade Santa Cecilia / Laboratorio de Ecotoxicología; J.R. Rogero, Universidade de São Paulo / Instituto de Pesquisas Energéticas e Nucleares

Many studies have reported the presence of pharmaceuticals and personal care products (PPCPs) in coastal environments in the last decades. However, still there is a lack of information about sublethal effects in marine organisms exposed to PPCPs in sediments. The aim of this study was to assess physiological effects of triclosan (TCS) and 17α-ethinylestradiol (EE2) spiked sediments (concentrations ranging from 0.01 to 1.00 ng g⁻¹) to the mussel Mytella falcata by means of the neutral red retention time assay (NRRT). Significant decrease of the lysosomal membrane stability was observed at environmentally relevant concentrations for both compounds (below 0.10 ng g⁻¹). The results suggest important risk to the non-target organisms since such response has been related to effects in higher levels of biological organization, which may affect their ecological fitness. This study showed the first evidences of physiological effects of TCS and EE2 at environmentally relevant concentrations in marine sediments and it reinforces the need of controlling inputs of TCS and EE2 in marine environments.

PT104. Lethal and sublethal effects of carbamazepine,ildenafil,clarithromycin and the binary mixtures on freshwater fish

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The occurrence of pharmaceuticals has been identified in wastewater effluents and surface waters and concern has risen of the potential adverse effects on the aquatic ecosystems. Toxicity of these compounds on Neotropical species is almost unknown and extrapolation with Holartic species is usually used for risk assessment. In addition, these compounds typically occur in complex mixtures and the evaluation of potential interactions is necessary. In the present study lethal and sublethal effects of single and binary mixtures of three frequently observed pharmaceuticals in wastewaters and surface waters of Argentina were assessed using freshwater fish. Lethal effects of single and binary mixtures were assessed by means of standardized acute toxicity test using the autochthonous fish species, pejerrey (Odontesthes bonariensis). Sublethal effects of single and binary mixtures were assessed using a selected suit of biomarkers on juveniles of common carp (Cyprinus carpio) exposed to 0.42 and 42 µM of each pharmaceutical and the binary mixture during 96h. Acute lethal toxicity test indicate moderate to slight toxicity induced by the tested pharmaceuticals (96h-LC50 (mg/L): 6.4, 16.2, >solubility, for sildenafil, carbamazepine and clarithromycin, respectively) and agonistic interaction for the binary mixtures. A clear response was not observed for any of the selected biomarkers selected at the hepatic biotransformation (EROD, BROD) or antioxidant (CAT) enzymes, or oxidative stress (TBARs). Alteration of brain AchE was neither observed by carbamazepine, single or in mixtures. In summary, the studied pharmaceuticals or their mixtures seems not to induce generalized acute toxic effects on the studied fish. Longer-term exposures and more specific responses should be assessed to reach a more general conclusion about potential risk of these pharmaceuticals.

PT105. Occurrence and biological effects of illicit drugs in a Brazilian coastal zone (Santos bay, São Paulo)

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The occurrence and effects of illicit drugs discharged by a WWTP in Santos Bay (São Paulo, Brazil) were evaluated by analyzing the chemical contamination and a battery of acute and chronic bioassays employing the brown mussel Perna perna. Five sites were chosen directly affected by WWTP effluents. Results evidenced aquatic contamination (superficial and deep water) by cocaine and its metabolite benzoylecgonine. Environmental concentrations of cocaine ranged from 12.6 to 537.0 ng/L-1, while benzoylecgonine ranged from 4.6 to 20.8 ng/L-1. Acute (inhibited fertilization) and chronic (abnormal embryonic development) effects of crack cocaine were found in gametes and embryos exposed to 4.5 mg/L-1, whereas cytotoxicity (reduced lysosomal membrane stability) was found in adult organisms exposed to 0.5 mg/L-1. Environmental concentrations and ecotoxicological data were integrated to assess environmental risk. The quotient denoted high risk of this emerging contaminant in Santos Bay.

PT106. Hepatic responses in Prochilodus lineatus caged in a river receiving sewage effluent.

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Evidences of “in situ” adverse effects induced by wastewater discharges on aquatic fauna were scarce in Latin America. Caged fish was conducted to investigate the impact of a sewage effluent on oxidative stress, metabolic parameters and histological alterations in liver of juveniles Prochilodus lineatus. Fish were caged during 15 days in the Colastiné River at the following sites: 2 km upstream, immediately and 2 km downstream from the sewage effluent discharge point. Physicochemical parameters and the occurrence of some pharmaceuticals in water samples were analyzed in each site. Antioxidants enzymes (Catalase, Glutathione reductase, Glutathione-S-transferase: GST, Superoxide dismutase), transaminases activities (L-Alanine-2-oxoglutarate aminotransferase, L-Aspartate-2-oxoglutarate aminotransferase: AST), lipid peroxidation, energetic cost (glycogen, lipid, protein) and histopathology were assessed in the liver of caged fish. Most environmental variables were similar in the three sites, except for nitrite, phosphorus and total and fecal coliforms, which were higher in the effluents compared with upstream and downstream sites. Close to the effluent discharge, mean dissolved levels of caffeine, atenolol, enalapril and sildenafil were 0.166, 0.065, 0.436, 5.452, 8.541 µg/L, respectively. Caged fish exposed to the effluent showed a decrease of the GST activity, higher levels of AST activity and lipid peroxidation, compared with upstream and downstream caged fish. Also, lipids contents were lower in the effluent caged fish; while glycoprotein contents were lower in downstream caged fish. Histological alteration recorded in fish from effluent site included focal necrosis, irregular sharped of nucleus of hepatocytes and occurrence of abundant yellow-brown granules indicating bile stagnation. Biochemical and histological biomarker detected alterations in liver of caged fish exposed at wastewater effluents and suggest liver toxicity induced for this exposition.

PT107. Occurrence perfluorochemicals (PFCs) in soil of Concepción Bay, in Central Chile

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Per- and poly-fluorinated compounds (PFCs) are a large group of anthropogenic chemicals that holds unique surfactant properties. PFCs have been used in a wide range of domestic, commercial and industrial products, and have been released to the environment from various sources. The compounds are ubiquitous in the environment on a global scale. Due to their chemical properties this compounds are toxic, persistent in the environment, bioaccumulating in organisms, biomagnifying in the food chain, and can be carcinogenic. Based on the adverse effects of PFCs in the environment perfluorooctosulfonic acid (PFOS) was added to Annex B of the Stockholm convention on persistent organic pollutants in 2009. However, only limited information exists on the occurrence and fate of PFCs and other PFCs in Latin American countries. Concepción Bay is a coastal embayment located in the Biobío Region of central Chile. The bay supports the adjacent coastal aquatic ecosystem, wild life and human food chain. However, Concepción Bay is surrounded by one of the most industrialized and urbanized areas of Chile. In this study we investigated the occurrence of PFCs (21 compounds) in soils samples taken from the surrounding areas of Concepción Bay (n=6 sites). All samples were extracted with methanol with the addition of ammonium acetate using an automatic extractor. The separation, identification and quantification of all target PFCs were performed using high performance liquid chromatography. Total organic carbon was also measured. Results showed that from all 21 PFCs screened, only 6 compounds were detected. Perfluorooctanoic acid (PFOA) was detected in most of the samples and ranged ~5 to 10 pg/g dry weight (d.w.). Perfluorooctane sulfonate (PFOS) was only detected in 1 sampling site (at FT) with ~5 pg/g d.w. The longchain PFCs (PFHxA, PFtFA, PFtDeA) were the most abundant compounds ranging from ~2 to ~12 pg/g d.w. These levels are lower than other studies around the world that show PFCs concentrations in the range of ng/g d.w. However, these contaminants are frequently detected in both the environment and biota, however the endocrine disruption potentials and underlying mechanism of long-chain PFAAs have not yet been fully understood in organisms. This study is the first to report levels of PFCs in soils in Concepción Bay in central Chile. Further studies are need in order to elucidate the potential consequences of PFCs levels in terrestrial and marine ecosystems.

PT108. The pollution issue in protected areas: contrasting realities for a common problem.

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Current data show that global biodiversity is in crisis, thus, protected areas (PAs) play (like never before) a fundamental role in protecting species and ecosystems. Habitat loss, poaching, and exotic species introduction are common threats largely known and included in management plans inside PAs, but the assessment of the impact of pollution on biodiversity maintenance in these key sites is virtually absent in both PAs management plans and the scientific literature. For instance, pollution is known to adversely alter reproduction in wildlife but their effects are not necessarily obvious in the short term. Thus, typical conservation/mitigation activities in PAs such as the maintenance or enhancement of species abundance can be a waste of funds if pollution adversely affects reproduction. Likewise, sub-lethal effects caused by the constant exposure of ecosystem to the unseen low levels of contaminants such endothrice disrupters inside these areas, will be hardly detected without explicit research that includes contaminants determination and/or appropriate tools to assess their toxicological effects. The results from toxicological studies in PAs with a variety of methodologies from US and Latin America demonstrate that the problem is widespread and poorly understood while very relevant for the ecosystem and the people welfare. The respond of societies to pollution issue inside PAs varies in each country with big differences between the North and South hemisphere, but also with several coincidences. The complexity of the task explains in part why this issue is not fully included in PAs management globally. Nevertheless, other issues such as the disconnection between fundamental disciplines (i.e. ecology/wildlife conservation and toxicology) may explain the lack of the inclusion of pollution as a common threat inside PAs. Furthermore, new available methodologies could help to greatly advance to comprehend this issue. Since this topic is not well assessed in the scientist community, the discussion and further implementation of management options by the managers of the areas and/or policy makers seems improbable. In a world were a polluted site is a common problem, people tend to be more appealed when parks/pristine areas are degraded or polluted, therefore, this areas may represent an opportunity to highlight the pollution issue and search for innovative solutions.

PT109. Native reptiles as models of toxicological studies in protected and non-protected areas

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El incremento sostenido de los cultivos en Argentina tuvo una explosión a inicios de la década del noventa, estimulado por el desarrollo de cultivos resistentes, los sistemas de siembra directa y los precios crecientes en el mercado internacional. Una de las consecuencias más graves de este proceso es la deforestación, la fragmentación del hábitat, el deterioro del suelo y el uso excesivo de los agroquímicos. Inevitablemente, un porcentaje importante de los plaguicidas aplicados no impacta sobre los organismos blanco, sino que se dispersa en el ambiente (agua, suelo y aire); las especies de flora y fauna nativas no están exentas a estas adversidades y son varias las formas en que pueden quedar expuestas a esos agroquímicos. La mayoría de los reptiles presentan características particulares para ser consideradas modelos de evaluación a contaminantes. Entre las más importantes podemos mencionar la longevidad, la presencia en una importante diversidad de hábitats, distribución geográfica extensa, entre otras. Tales características plantean la posibilidad de utilizar estos organismos como centinelas de contaminación ambiental. El yacaré oervo (Caiman latirostris) es uno de las dos especies de crocodiloides que habitan en la República Argentina, y se distribuyen en un área compuesta por 8 PAs dentro del centro-norte del país. Del mismo modo, la iguana oerva (Salvator merianae) posee un área de distribución importante en nuestro país. La existencia de ambas especies está indefectiblemente asociada tanto al agua como a la tierra. Esto es considerado una gran ventaja porque permite hacer una evaluación más integral de la exposición a contaminantes de uso agrícola, entre otros. En la actualidad, el

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avance sostenido del sistema productivo ha puesto en evidencia que, a este ritmo, la conservación de las especies quedará reducida a las áreas protegidas. La permanente evaluación del impacto sobre las especies silvestres tiene que servir de fundamento para la elaboración de políticas ambientales.

PT110. Effluents from land-based aquacultures in North Patagonian streams: Dissolved organic matter and oxidative stress in aquatic organisms

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Chile is the country with the second largest production of salmon and the young salmon are grown in land-based aquacultures. Such aquacultures may be responsible for large inputs of biodegradable organic matter, which may stress the mostly pristine river systems of Northern Patagonia. However, the effects of land-based aquacultures on stream dissolved organic matter (DOM), its biodegradability and biological effects are unclear. To assess these effects, we investigated the DOM effluent of aquacultures at different spatial and temporal scales and combined this to an investigation of DOM biodegradability and biological responses of the plant Lemna valdiviana and the crustacean Hyalella azteca. We measured dissolved organic carbon (DOC) concentrations and DOM composition, as well as intracellular oxidative stress responses (catalase, glutathione-s-transferase, glutathione reductase, glutathione peroxidase and glutathione) for the two test organisms. We consistently found an increase of DOC concentrations and a dominance of protein-like fluorescence, which was highly biodegradable. Laboratory and field bioassays with both organisms exposed to effluent water showed an increase of intracellular stress responses. We conclude that the large amounts of biodegradable, yet harmful organic matter are exported from land-based aquaculture, which probably has strong effects on the ecological structure and function of North Patagonian streams.

PT111. Anthropogenic and natural factors related to sediment toxicity in Marine Protected Areas from the central coast of São Paulo (Brazil)

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Marine Protected Areas (MPAs) are increasingly being established around the world; many of them are located close to coastal cities, ports and anthropic activities. However, for most of them, the potential in use is unknown. This is the case of São Paulo State (Southeast Brazil), which coincide mainly is bordered by MPAs. The aim of this study is to assess the sediment quality in some MPAs located on the central coast of São Paulo (Laje dos Santos Marine State Park – PEMLS; Xixova-Japui State Park – PEXJ; and Central Coast Marine Protection Area – APAMLC), that could be influenced by the multiple contamination sources installed in the region. Two sampling surveys were conducted, in the Spring (September/October 2013) and Summer (January 2014). Sediment samples were collected in 10 sites, distributed in PEMLS, PEXJ and APAMLC and their vicinities. Aliquots were separated for geochemical (sediment texture, Total Organic Carbon, CaCO₃, metals, n-alkanes and polycyclic aromatic hydrocarbons) and ecotoxicological (whole-sediment – WS; and sediment-water interface – SWI) analyzes. Principal component analysis (PCA) was used to integrate data. Most of sediments exhibited low concentrations of metals and organic compounds, with exception of those from P2 (within APAMLC) where moderate levels of contaminants were detected. Sediments from P7 and P9 (PEMLS) exhibited enrichment for contaminants, which was related to the higher contents of fines in these areas. Sediments collected under greater influence of anthropic activities showed varying results, as P1 (PEXJ, influenced by sewage) and P4 (influenced by disposal of dredged sediments); this probably was related also the oceanographic features (waves and currents that remobilize particles).

Sediments from APAMLC showed toxicity in the first campaign, despite the low concentrations of chemicals, while sediments collected within the PEMLS were rich in CaCO₃ and presented toxicity (P5, P7 and P9). The PCA indicated a common contribution of the sediment properties to the toxicities, especially the CaCO₃ contents. In sediments rich in CaCO₃, toxicity might be caused by physical effects or presence of toxins related to calcareous algae. We concluded that both natural and anthropic factors are causing toxicity in sediments from the MPAs located on the central coast of São Paulo.

PT112. Assessing moderately contaminated estuaries: the use of a multilevel-biomarker approach in fish within an WOE-based sediment quality assessment

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Previous studies in highly impacted environments have attested the usefulness of biomarker tools as a part of Weight of Evidence assessment (WOE) in marine environments. However, once that isolated responses of biomarkers are often difficult to interpret due to many confounding factors, the integration of biomarker data into multiple-biomarker indices for the evaluation of contaminant-induced stress is a helpful tool to aid in the interpretation of the responses. The aim of this study was to evaluate the suitability of an weighted index of biomarker responses (WBR) within a WOE approach to assess a global level of contamination. The protected area (Canoas-Itapuã-Peruíbe Environmental Protected Area, Brazil), which is subjected to moderate levels of contaminants. The research included: (i) exposure assessment, through the estimation of indices integrating non-specific biomarkers of exposure (GST, GPx, GSH), as well as metallothionein levels, PAHs in bile, levels of metals and As in sediments and in essential fish (liver and muscle tissues); (ii) effects assessment in both resident fish (estimation of indices integrating biomarkers of effects - LPO and DNA damage in target organs, macromolecular damages, histopathology, general health condition - and activity of AChE in muscle) and sediments (toxicity tests - copepod fecundity and sea urchin embryolarval development); (iv) environmental quality characterization as integration of individual Lines of Evidence (LOEs) through multivariate analysis (FA/PCA). The application of WBR is a promising approach to MPA environmental quality assessment, simplifying the interpretation of the individual biomarker responses to environmental contaminants. The WBR that incorporates histopathological data (WBRreflects in fish) in resident fish was better associated with sediment toxicity and contamination. On the other hand, the biomarker indices that included only sub-cellular and cellular responses were better associated with bioaccumulated metals and As. An internal mechanism of detoxification (either accumulation and/or depuration) can explain the lack of relationship between damages in tissues and sediment contamination. The inclusion of biomarker indices based on sub-cellular, cellular, and histological responses within the WOE approach, was useful to discriminate the different sites within a range of environmental degradation in this moderately contaminated estuary-lagoon.

PT113. Trace Metals in penguins: A Review of published data

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Penguins are seabirds that inhabit the Southern Hemisphere. They are animals that are at the top of the food web of marine ecosystems, and have a crucial role in maintaining the environment’ health. Even though penguins live in remote areas of the world, humans have a big impact on them. Actually, penguins are considered among the endangered seabirds of the world, since about two-thirds of penguin species are on the IUCN Red List of Threatened Species. Trace metals can be divided into essential and non-essential elements and can become toxic depending on dosage. We reviewed the Trace Metals levels (dry weight) reported from different species of penguins and biological matrices. Gentoo penguin (Pygoscelis papua) is the species that exhibits the highest concentrations for non-essential trace elements (Al and Hg), whereas for the essential trace elements showed the highest levels of Mn. Additionally, the highest concentrations for non-essential trace elements (As and Pb), and the essential trace elements (Cu and Zn) have been reported in Humboldt penguins (Spheniscus humboldti). Most of the studies have been done on Gentoo penguin, Chinstrap penguin (Pygoscelis Antartica) and Adélie penguin (Pygoscelis adeliae), but further studies in other penguin species are needed. The analysis of the levels of trace metals in biological
matrices of penguins showed that escrata presented the highest concentrations of Pb (a non-essential trace element), and Cu, Zn and Mn (two essential trace elements). Feathered showed the highest concentrations of Hg. High concentrations of As, Hg and Mn in Gentoo penguin may be related to the higher trophic level than other penguin species, whereas higher concentrations of As, Pb, Zn and Cu in Humboldt penguins can be explained because this species inhabit the cold water, a fact that mobilizes antipodal activity. Escrata and feathers may be the main detoxification pathway of trace elements used by penguins. Also, these two matrices can be used as a non-destructive biological material for monitoring temporal and spatial trends. However a standardized protocol is needed. Acknowledgements: Winfred E. Espejo is scholarship CONICYT-Chile for PhD studies. This study was financially supported by the project INACH RG 09-14 granted to J. Celis and by the project 214.074.051-1.0 of the Dirección de Investigación de la Universidad de Concepción granted to M. Sandoval. Thanks are also given to FONDECYT 1140466 granted to R. Barra.

**PT114. Impact of metals derived from passive mining wastes on crabs N. granulata from the Natural Protected Area San Antonio bay, Rio Negro, Argentina**

E. Giarratano, C. Marinho, Centro Nacional Patagónico; G. Malanga, Facultad de Farmacia y Bioquímica - Universidad de Buenos Aires; M. Gil, Centro Nacional Patagónico

The Natural Protected Area San Antonio bay is of particular importance for its congregation of migratory shorebirds and has been declared one of the Western Hemisphere Shorebird Reserve Network (WHSRN) International sites. In the Patagonian coastal area there are virtually no mining activities releasing metals into the environment, except for San Antonio Bay in the northwest of San Matías gulf until 1980. High levels of Pb, Cu, Zn and Cd have been found in sediments, mussels and crabs evidencing that waste piles from the abandoned mine are still leaching various metals to the environment. Crab Neohelice granulata has important ecological roles controlling different physicochemical and biological aspects in mudflats and salt marshes and it is also considered a key species in the energy transfer. Present study represents the first assessment of variations in oxidative stress biomarkers in N. granulata from San Antonio bay under field conditions, associated mainly to metal contamination coming from passive mining wastes. Three sites were sampled within this sea inlet: close to the waste pile, in front of a fish plant and in the port area. Punta Perdices located at the southeast of the bay was considered as a control site. Metal accumulation and biomarkers such as some antioxidant molecules (α-tocopherol), oxidative damage (lipid radical), antioxidant enzymes (catalase and glutathione-S-transferase) and metallothionein content in tissues of male crab N. granulata were determined three months from November 2012 to August 2013. Accumulation of Ni, Zn, Cr and Al varied only with seasons although without a constant trend, meanwhile Cd, Cu and Pb also varied among sites being higher in Pile and Port. Biochemical results indicated that variations in catalase activity was only site specific being maximum in Pile; meanwhile lipid radical, α-tocopherol and metallothioneins were only seasonal specific being higher in autumn and winter. In general, biochemical responses were inversely related to some metals (Ni, Cr, Pb and Cu). Results evidenced that crabs still accumulate high concentrations of metals deposited long time ago having the potentiality to affect not only themselves, but also be passed up food chains. Considering the differences in species sensitivity to toxicants, levels of metals in San Antonio could represent a potential factor reducing the biodiversity of this Natural Protected Area.

**PT115. Fate, Transport, and Toxicity of Wastewater-borne Contaminants: An Overview**

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The discovery and use of chemicals over the last century have led to remarkable increase in the human life-span. Recently, there has been increasing concern of presence and impacts of many contaminants of emerging concern (CECs) in various environmental matrices such as water, sediments, plants, non-target aquatic and terrestrial organisms. These CECs are transported via a variety of surface and sub-surface pathways to water bodies and domestic wastewater is a rich source of CECs in our waterways. Wastewater in most of the world is largely naturally managed systems. In urban areas, wastewater is collected from an individual house or business, treated, and dispersed onsite in groundwater via soil profile by onsite wastewater treatment systems (commonly called septic system) and centralized treatment where wastewater from large population (city, county) is collected, treated, and discharged in surface waters via streams/rivers by wastewater treatment plants. Thus, situations where CECs can be more concentrated are aquatic systems that receive treated wastewater and terrestrial systems (soil) that receive regular inputs of bio-solids and recycled wastewater. Research shows that several of these contaminants can be potentially toxic to aquatic organisms and some plant species can bio-acumulate CECs. This overview presentation will articulate our major known and unknowns as related to fate, transport, and toxicity of wastewater-borne contaminants.

**Thursday**

**Fate and Effects of Nanomaterials**

**PT116. Use of cell in vitro systems to determine the toxicity of metal nanoparticles: contribution of nanoparticles, ions and oxidative stress to toxicity**

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Manufactured nanomaterials (MNs) are constituted by particles with at least one dimension between 1 and 100 nm. The increasing use of MNs is also raising the possibility of release to the environment and the risk of deleterious effects to humans and wildlife. It is therefore essential to characterize in detail the mechanisms underlying the toxic action of nanoparticles (NPs) in order to understand the hazard associated to their use and to support risk assessment approaches. In vitro cell cultures constitute a perfect tool for this characterization. Metal based MNs in liquid media appear normally as suspensions constituted by NPs and ions coming from the partial dissolution of MNs. Both, NPs and ions should contribute to the global toxicity of MNs. In addition, the oxidative stress paradigm associating the toxicity of NPs to the generated oxidative stress has been generally accepted. The main objective of this work was to determine the contribution of NPs and ions and this of oxidative stress to the toxicity generated in vitro by a number of MNs. Mammalian and piscine cell lines were exposed to ZnO and Cu NPs and to superoxants free of NPs obtained after centrifugation of the original suspensions. The contribution of NPs and ions to the toxicity was independent after estimations following the response addition model. Simultaneous exposures of ZnO and Cu NPs evidenced a potentiation of toxicity that was associated with an increased uptake of Zn to the inner of the cells. To determine the contribution of oxidative stress to the toxicity, we activated the aryl hydrocarbon receptor (AhR) dependent antioxidant defense of the cell. When cells were exposed simultaneously to an AhR ligand and to Cu NPs, reactive oxygen species (ROS) induced by Cu NPs alone were completely abrogated. However, no parallel reduction of cytotoxicity was observed suggesting that toxicity is not completely dependent on oxidative stress. In addition, Ag NPs are able to provoke a clear toxic effect with only a limited induction of ROS. Acknowledgements: financially supported by FP7 projects MARINA (No 263215), GUIDENANO (No 604367) and ITN-ECO (No 238701).

**PT117. In silico evaluation of interactions between mitochondrial proteins and single walled carbon nanotubes (SWCNT)**

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In present study it was evaluated in silico interactions of pristine (SWCNT), hydroxylated (SWCNT-OH) and carboxylated (SWCNT-COOH) single walled carbon nanotubes with adenine nucleotide translocator 1 (ANT-1), a mitochondrial carrier. Different SWCNT were also evaluated according Hamada index: armchair (n=m), zig-zag (m=0; n>0) and chiral (n>m>0). The interaction energies were determined through the docking software AutoDock Vina using a Virtual Screening Framework. The results showed that: (1) the free energy of binding (FEB) was statistically more negative (p < 0.05) for SWCNT-COOH, followed by SWCNT-OH and then by SWCNT, indicating that charged or polar groups favored the interaction to ANT-1; (2) significant linear relationships between FEB and n were found for zig-zag SWCNT (R2= 0.95; p < 0.05) and SWCNT-COOH (R2= 0.95; p < 0.05); (3) some amino acids (Arg 79, Asn 87, Lys 91, Arg 187, Arg 234 and Arg 279) of ANT-1 that showed low inter-atomic distances with the specific inhibitor carboxyl tyrosine, were the same when inter-atomic distances were evaluated for ANT-1 and SWCNT (pristine and functionalized) interactions and (4) aligned sequences of ANT-1 from different species (vertebrate
and invertebrate) showed that these critical amino acids were conserved. Obtained in silico quantitative structure-affinity relationships should be useful to estimate interactions of SWCNT with proteins based on their physico-chemical properties. Finally, alignment results allow the extrapolation of present findings to other animal models, including those commonly employed in ecotoxicology as fish Danio rerio.

**PT118. Interactions of cells with nanomaterials**

M. Desimone, Fachulci de Farmacia y Bioquímica Universidad de Buenos Aires

The application of nanomaterials in different fields experienced a great development. The driving forces for these developments are the possibility to design nanomaterials with specific properties. Moreover, it is possible to tune the characteristics of the nanomaterials to meet the requirements of each specific cell and desired application. Herein, we present different strategies developed to contribute to understand the nature of this inherently complicated cell-nanomaterial interactions. The interaction of cells with materials is focused on nanoporous surfaces, nanoparticles and gels. In the first case it was demonstrated that it is possible to engineer surfaces in terms of wettability, chemical composition and porosity to control cell adhesion. Secondly, results further confirm that the interaction of nanoparticles with mammalian cells depends on their size, surface chemistry and dose among other experimental parameters. The mammalian cells show high sensitivity to surface modification of the particles. Moreover, the cytotoxicity towards L929 fibroblasts was mainly observed for bare particles, whereas sulfonate-, amine- and thiol-grafted particles had less detrimental effects. Finally, recent advances in the synthesis of inorganic and hybrid gels for mammalian cell immobilization are presented. Particularly, results focused in the different characteristics of the gel required for adherent and non-adherent cells are discussed.

**PT119. Effect of SiO2NPs on blood components**

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In recent years, silica nanoparticles (SiO2NPs) have gained attention because of their potential use for diagnosis or drug delivery. However, if nanoparticles (NPs) get in contact with blood components, different molecules (protein, lipids, carbohydrates, etc.) could be adsorbed on its surface modifying its behavior. Based on previously described, the aim of this work is to analyze the interaction between SiO2NPs and blood components. Negative SiO2NPs were synthesized using the Stöber method. Positive NPs were obtained after APTES treatment. Size and morphology were assessed using a transmission electron microscope. The hydrodynamic diameter and zeta potential of NPs were characterized by dynamic light scattering. After NPs-serum incubation, we observed, by SDS-PAGE and Bradford method, the adsorption capacity of several human serum proteins (~6mg/ml) by all SiO2NPs (100 mM). The adsorption remained stable for at least 9 days. In order to known the hemolytic behaviors of NP, human red blood cells (RBC) were incubated with NPs (10 mM) and hemoglobin released (DO 540 nm) were determinate as indicator of RBC hemolysis. We determined that negative SiO2NPs previously treated with human serum decrease the RBC hemolysis (2.6-4.1 % hemolysis) respect negative SiO2NPs only (81.8-86.4 % hemolysis). On the other hand, positive NPs do not affect RBC (0-8 % hemolysis). For study the effect of NP on coagulation the partial thromboplastin time (aPTT) was determined using a semiautomatic blood coagulation analyzer. We observed that all SiO2NPs act as anticoagulants (12-53s) while this effect decreases with SiO2NPs previously treated with human serum (0.1-26 s). Because the importance of calcium in coagulation, we determine its concentration adsorbed on the NPs. The concentration was higher in the negative NPs treated or not with human serum respects positive NPs. In this work, we characterized and evaluated interaction of silica nanoparticles with blood components. These preliminary results allow us to continue with the studies with other cellular component in circulation to check the potential usefulness of these nanoparticles for drug delivery.

**Federal University of Paraná / Department of Genetics**

**C. Faciatti, Universidade Federal de Santa Catarina / Depto de Eng Sanitário e Ambiental**

**PT120. Genotoxic evaluation of titanium dioxide nanoparticles (NPTiO2) and lead (Pb2+) on a Neotropical fish species.**

T. Vicari, UFPR / Genetics; H.d. Schicora Gonçalves, Federal University of Paraná / Department of Genetics; L. Oya Silva, UFPR / Genetics; T. Klingelfuss, Federal University of Paraná / Department of Genetics; M. Cestari, UFPR / Genética

The aquatic environment is one of the main ecosystems that suffer from the impacts caused by man, since it constitutes the final compartment of various substances generated by anthropogenic activity. Thus, among the pollutants currently produced by humanity on a large scale are the nanomaterials. Nanomaterials, by definition, are particles which have at least one of their dimensions smaller than 100 nanometers and, therefore, have particular physical-chemical characteristics which make it difficult to predict the behavior of such materials in the environment. Titanium dioxide nanoparticles are one of the most produced particles worldwide and, for this reason their impact on aquatic organisms must be assessed. In addition, there are evidences that nanoparticles may carry metals, in other words, they have the capacity to adsorb some metals to the surface. Therefore, it is necessary to carry out studies about the genotoxicity of these nanomaterials either alone or in combination with metals. With respect to metals, lead is a ubiquitous metal and, despite the reduction in its use, it retains its status as a priority pollutant (USEPA, 2006). Considering an environmental context, the nanoparticles can be both in water column and in the sediments, which would inevitably enter the aquatic food chain. The aim of this study was to assess the genotoxic potential of titanium dioxide nanoparticles (NPTiO2) and lead (Pb2+), alone and combined, on a Neotropical fish species Hoplias intermedius, after trophic exposure. For the bioassays, the species was exposed to concentrations of 0.1 μg/g, 1μg/g and 10 μg/g of titanium dioxide nanoparticles and 21μg/g of inorganic lead (Pb2+), alone and combined. The exposure occurred through a trophic manner, every five days, for a period of 70 days, and a total of 14 feed cycles. For genotoxic evaluation, the piscine micronucleus test, with nuclear morphological alterations analysis, and the comet assay in red blood cells were performed. The piscine micronucleus test and nuclear morphological alterations showed statistical significance to the notched tail and head comet shape. Since the interaction between nuclear morphology and alterations is not yet fully elucidated, and the presence of micronucleate erythrocytes was not significant, other biomarkers should be performed in order to clarify the genotoxic potential of substances concerned.

**C. Faciatti, Universidade Federal de Santa Catarina / Depto de Eng Sanitário e Ambiental; B.V. Osar, R.A. Gonçalves, S.P. Melegari, D.S. Vicentini, Universidad Nacional de Lujan / Ciencias basicas; M. De Marzi, Universidad Federal de Santa Catarina / Departamento de Engenharia Sanitária e Ambiental; W.G. Matias, Universidade Federal de Santa Catarina / Engenharia Sanitária e Ambiental**

**PT121. Comparative effects of zinc oxide toxicity in bulk, nanoparticle and nanorods forms to Daphnia magna and Aliivibrio fisheri.**

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With the advancement of nanotechnology, material properties, especially with regard to decreased size and changes in structural form can lead to biological effects related to different toxic effects observed when used in microscale particles. Zinc oxide (ZnO) is a chemical compound widely used because of its astringent, antiseptic, anti-inflammatory and secative properties, being generally used in different divisions of industry mainly as fungicide and bactericide. This increase in the use of materials at the nanoscale increased the need for information on the toxicity and the safety of these nanomaterials since they can reach the aquatic environment intentionally or accidentally. This research is carrying out an assessment of the effects of ZnO in different sizes and shapes for microcystosacace Daphnia magna and the luminescent marine bacteria Aliivibrio fisheri. Suspensions of ZnO bulk (Sigma-Aldrich), ZnO nanoparticle (ZnO NP-Synthesized according to Costa et al (2007)), and ZnO nanorods (ZnO NR -synthesized according to Yang & Liu (2011)) were characterized by Transmission Electron Microscopy (TEM) and used to carry out acute toxicity tests with D. magna and A. fisheri. The results confirmed the TEM morphology showing ZnO NP synthesized spherical shape and an average diameter of 50nm, and to ZnO NR diameter of 30-40 nm and length of 100nm. The toxicity test with D. magna indicated that the ZnO bulk showed no toxicity while for ZnO NP and ZnO NR the CE50,48h were respectively 2.7 and 2.9 mgL⁻¹. For marine bacteria A. fishieri ZnO bulk produced CEC24h of 19.21 mgL⁻¹, and to ZnO NP and ZnO NR were respectively 12.3 and 28.8 mgL⁻¹. The results indicated that for D. magna the ZnO NR and NP showed high toxicity. For A. fishieri, NP ZnO showed high toxicity when compared to NR, and this behavior is possibly in relation to its smaller size and hence increased surface area. The major toxicity of ZnO for the A. fishieri is probably due to increased solubility of Zn with Cl ions released in the medium during tests. Additional studies are necessary to elucidate the differences in toxicity observed for the different organisms. Costa, A. C. F. et al. Avaliação do tamanho da partícula do ZnO obtido pelo método de Pechini.Revist Eletrôn de Materi e Proces, 2007, Yang, Y.; Liu, T. Fabrication and characterization of graphene oxide/zinc oxide nanorods hybrid. Appl Surface Science 257:21, 2011.**
PT122. Effect of size and charge of silica nanoparticles on human lice (Pediculus humanus capitis) (De Geer).

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In the last decade, the development of products at nanometric scale in fields of science as health, energy, catalysis, agriculture and environment has increased significantly. The progress in the ability to synthesize nanoparticles (NPs) with homogeneous size, charge and structure has conducted to employ these particles as insecticides. Nowadays it has been described the use of nanostructured alumina in controlling pest species of stored food and silver NPs as larvicide mosquito insecticide. Moreover, toxicity studies with silica nanoparticles (SiNPs) on mosquitoes, (vectors of Malaria, Dengue and Chickengunya) demonstrated its effectiveness as potential insecticide for chemical control. The advantage of SiNPs is the possibility to synthesize particles with different sizes and charges and these variables determine their insecticidal capacity, stability and environmental safety. The mode of action of the SiNPs is by drying cuticle (physical absorption) and also likely by chitin-silica interactions. Herein, we evaluate the toxicity of SiNPs with different size and charges on human lice, Pediculus humanus capitis (De Geer). Solid silica nanoparticles were obtained by Stöber method. Particles from 60 to 300 nanometers with positive and negative charge were obtained. Adult lice were collected from heads of children (6-12 years old) and then transported to the laboratory where they were maintained at 18°C and 97% RH. Groups of standardized lice were placed on Petri dishes and exposed to 20 µl of different size and charge SiNPs solutions. The exposition was held for 2 minutes. The values of mortality were calculated to compare the toxicity of different charges and sizes of SiNPs on P. humanus capitis. ANOVA showed in every condition, by 41% to 43% and 35 to 51%, respectively (p < 0.05). These results suggested insecticidal capacity of SiNPs in this species as previously described in other species and showed a higher susceptibility of P. humanus capitis to negative SiNPs than to positive SiNPs (Mortality = (SiNPs -60: 72.90 ± 0.06 and SiNPs -300: 66.00 ± 0.13) % vs. (SiNPs + 60: 6.30 ± 0.09 and SiNPs +300 nm: 24.3 ± 0.22) %. These results suggested insecticidal capacity of SiNPs in this species as previously described in other species and showed a higher susceptibility of P. humanus capitis to negative SiNPs than to positive SiNPs. These data contribute to further understand the potential toxicological effect that would be associated to nanoparticles and how they can be modify in order to meet the requirements of each desired application, for example as insecticide in this study.

PT123. Lung O2 metabolism after an acute exposure to transition metals present in nanoparticles

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Several studies have shown that the exposure to commercial or therapeutic nanoparticles (NP) might trigger, under certain conditions, toxic effects over the respiratory system. It is suggested that transition metals present in NP could play an important role in this scenario, via increased production of reactive O2 species and oxidative tissue damage, through Fenton-like chemical reactions. To address this hypothesis, the aim of this work was to study lung O2 metabolism after an acute exposure to transition metal-doped nanoparticles (NP). NP were built by the Stöber method. Their aerodynamic diameter was assessed by dynamic light scattering and metal content by atomic absorption. Female Swiss mice (25 g) were intranasally instilled with a suspension of silica NP containing Ni (II), Cd (II), Fe (III), or Cr (VI); at 0.01, 0.05, 0.1, and 1.0 mg metal/kg body weight. Control mice were handled in parallel and exposed to silica NP without transition metals. Tissue O2 consumption, NADPH oxidase (Nox) activity, and TBARS content were evaluated in lung samples 1 h after instillation. No changes were observed after Cd-NP exposure in any experimental condition. On the contrary, Ni-NP showed a significant increase by 35% to 67% in lung O2 consumption at every tested condition when compared to the control group (p < 0.05). Likewise, Nox activity and TBARS levels in lung were also significantly increased in every transition, by 24% to 43% and 35 to 51%, respectively (p < 0.05). Regarding Fe-NP, a significant increase in lung O2 consumption by 48% and 52% at 0.1 and 1.0 mg Fe/kg (p < 0.05) was observed when compared to the control group. Nox activity was also increased by 27%, 35%, and 87% at 0.05, 0.01, and 1.0 mg Fe/kg (p < 0.05). Moreover, TBARS content was significantly increased by 57% and 56% at 0.10 and 1.0 mg Fe/kg, respectively (p < 0.05). When Cr-NP were tested, lung O2 consumption was increased by 44% at 0.05 mg Cr/kg (p < 0.001). Interestingly, while Nox activity showed no significant changes when compared to the control group, TBARS content showed a significant increase by 27% and 43% at 0.05 and 1.0 mg Cr/kg, respectively (p < 0.05). The present data suggests that transition metals like Ni, Fe, and Cr induce alterations in lung oxidative metabolism after NP exposure. These findings provide new insights to the understanding of mechanisms of toxicity triggered by metals present in NP.

How to Write Good Research and Get it accepted in a Good Journal.

PT124. Como escribir un buen trabajo de investigación, y lograr que sea aceptado en una buena revista científica.

D. Barceló, IIQAB-CSIC / Dept Environmental Chemistry; B.A. Wunderlin, Universidad Nacional de Córdoba / IICYT DPTO QUÍMICA ORGÁNICA FACULTAD DE CIENCIAS QUÍMICAS

Los participantes presentarán algunas de sus experiencias como editores y revisores de revistas científicas de alto impacto, remarcando cuales son, a su juicio, las claves para lograr que su trabajo sea aceptado. Con esta conferencia se desea contribuir a mejorar la calidad de los trabajos presentados por los participantes, quienes se interese por el proceso de revisión y publicación y desee mejorar su trabajo científico. A lo largo de la conferencia se abordarán temas como: a) La importancia de tener bien desarrolladas las conclusiones y la importancia del resumen, b) La selección del abstract y de los temas para la revisión, c) La forma en que se pueden acompañar artículos de un video o de un artículo de audio. Se discutirán también aspectos formativos como el uso correcto de los lenguajes científicos (incluso en el inglés) y en español.
PT126. Gestión Ambiental en un Organismo Público Nacional: Comisión Nacional de Energía Atómica

D. Cicero, Comisión Nacional de Energía Atómica / Environmental Management

La Comisión Nacional de Energía Atómica (CNEA) desarrolla todas sus actividades con una actitud responsable respecto del cuidado del ambiente, asegurando que la actividad nuclear sea sostenible. Aplica prácticas y procedimientos para que en todos los procesos existan medidas eficaces contra riesgos potenciales, a fin de proteger a las personas, a la sociedad y al ambiente. En el año 2003 la CNEA explicitó su política ambiental a través de la “Declaración de Política Ambiental” Es en dicho marco que la CNEA aprobó, en diciembre de 2008, su “Manual de Sistema de Gestión Ambiental” (SGA) que establece los objetivos y las metas, determina la estructura funcional y asigna las responsabilidades que en materia ambiental corresponden a cada uno de los sectores de la Institución. De conformidad con ello, la gestión ambiental de la CNEA se realiza bajo la modalidad de la responsabilidad repartida y compartida entre un organismo central en materia ambiental y los 19 sitios donde la institución desarrolla sus actividades a lo largo y ancho del país. Para lograr los objetivos propuestos en materia de desempeño ambiental, se propuso que la Gerencia de Gestión Ambiental de la GASNAYa entienda en el desarrollo y control del SGA; así como en la planificación de las estrategias de la Gestión Ambiental; participando con los sectores responsables de la ejecución de las actividades de la Institución en alcanzar dichos objetivos. Por su parte, los sectores que desarrollan sus actividades en los sitios tienen la responsabilidad de determinar y asignar los recursos (humanos, técnicos y económicos) para la implementación del “Sistema de Gestión Ambiental”, y de controlar su desarrollo en sus respectivas áreas. A partir del año 2013, el organismo central está estructurado en cuatro áreas: Fortalecimiento Ambiental; Auditoría Ambiental; Vigilancia y Monitoreo Ambiental; y, Análisis Ambiental. Las herramientas utilizadas para la mejora continua del desempeño ambiental de CNEA incluyen: un Programa de Auditorías Ambientales; un Programa de Vigilancia y Monitoreo Ambiental; un Programa de Capacitación; y, un Programa de I+D para la Gestión Ambiental.

PT127. La Sal Desde Una Mirada Geológica

J. Sosa Gomez, Facultad de Ciencias Naturales e Instituto Miguel Lillo

Del amplio abanico de los minerales es la Halita (sal) la que posee un arraigo poco usual en el imaginario humano, su simbología está presente en libros de contenido religioso, se han construido Catedrales en los vacíos dejados en las minas de sal y también es transportada como elemento esencial en la cintura de un canibal de Nueva Guinea. El origen geológico se remonta a diferentes ambientes emergiendo: continentales, marinos y recientemente otros observados sobre la superficie marciana. Los mecanismos de la Tectónica de Placas como la apertura del océano Atlántico hace 130 ma. dieron origen a importantes depósitos en las costas africanas y sudamericanas. Las fluctuaciones del nivel del mar es parte de otro de estos procesos que llevaron a la configuración de acumulaciones salinas como las que encontramos en el N Argentino y el Mesíno del Mar Mediterráneo. Estos depósitos son los que se explotan en el subsuelo del NE de Tucumán, región donde se encuentran numerosas vertientes salinas. Del amplio abanico de los minerales es la Halita (sal) la que posee un arraigo poco usual en el imaginario humano, su simbología está presente en libros de contenido religioso, se han construido Catedrales en los vacíos dejados en las minas de sal y también es transportada como elemento esencial en la cintura de un canibal de Nueva Guinea. El origen geológico se remonta a diferentes ambientes emergiendo: continentales, marinos y recientemente otros observados sobre la superficie marciana. Los mecanismos de la Tectónica de Placas como la apertura del océano Atlántico hace 130 ma. dieron origen a importantes depósitos en las costas africanas y sudamericanas. Las fluctuaciones del nivel del mar es parte de otro de estos procesos que llevaron a la configuración de acumulaciones salinas como las que encontramos en el N Argentino y el Mesíno del Mar Mediterráneo. Estos depósitos son los que se explotan en el subsuelo del NE de Tucumán, región donde se encuentran numerosas vertientes salinas.

PT128. The lack of coordination between the generation of knowledge and decision making

A. Fernandez-Cirelli, University of Buenos Aires

Water quality is one of the main environmental challenges. Waste water, industrial effluents as well as inappropriate agricultural practices may be pointed as pollution sources. Water quality is directly related to public health. When examining the contamination caused by a particular activity or at a specific site, we tend to focus on a single medium, An holistic approach allows to evaluate the synergistic and antagonistic interaction that can and do occur in real systems. Such an approach is fundamentally interdisciplinary in nature, requiring the active collaboration of many individuals trained in such different disciplines as chemistry, biology, geology, engineering, and economics, among others, and public policy. Although difficult to achieve, this approach will be important for future pollution management and regulation, and will be a bridge between generation of knowledge and decision making.

Ecosystem Services

PT129. Fungal bacterial interplays at biogeochemical interfaces: Microbial logistics for the management of contaminant biodegradation

L.Y. Wick, A. Steinbach, T. Berthold, H. Harms, S. Schamfuß, Helmholz Centre for Environmental Research UFZ/Environmental Microbiology

Knowledge to predict an ecosystem’s ability to degrade a chemical and to cope with an ever increasing variety of contaminants is still highly insufficient. Such prediction needs to interlink molecule-level properties of a substance with spatio-temporally emerging mechanisms of ecosystem functioning during its bio-degradation. Contaminant biodegradation in soil is a logistic problem as it needs to have “the right thing, at the right place, at the right time” for optimal metabolic activity. At biogeochemical interfaces in soils ‘microbial logistics’ is often aggravated by the concurrence of restricted bacterial mobility and retarded transfer of hydrophobic organic contaminants (HOC) such as alkanes. In order to cope with heterogeneous soil environments mycelial fungi have developed a unique network-based growth form. Unlike bacteria hyphae spread efficiently in the soil, penetrate air-water interfaces and cross over air-filled pores between the bacteria and contaminants in the vadose. In air-filled soil, enhanced homogenization of bacteria and contaminants can be achieved by bridging physical air gaps with fungal hyphae thus enabling substrate-directed mobilization of bacteria along chemical gradients. Here we demonstrate the shaping role of biogeochemical interfaces for the colonization fungal-bacterial communities and analyze the biodegradation-enhancing impact of mycelial dispersal networks on both the microbial transport and the translocation of HOC. We show that mycelial networks (i) act as effective dispersal networks for both undirected and targeted mobilization of contaminant degrading bacteria (‘fungal highways’), (ii) act as hotspots for horizontal gene transfer, (iii) increase the mobility of a wide range of HOC due to their translocation in their cytoplasmic streaming (‘fungal pipelines’), and (iv) improve the bioaccessibility and biodegradation of contaminants. Given their ubiquity and length of up to 1000 m g-1dry soil mycelia play a significant role for the ecosystem service of contaminant biodegradation and of the reduction of associated risk.

PT130. Net Environmental Benefit Analysis as a Risk Management Tool: Minimizing Impacts, Maximizing Benefits, and Optimizing Remediation Resources

J-A. Weier, CH2M Hill

Managing a contaminated site requires selecting a remedy that will protect human health and the environment. Yet, it is common for the effects of remedy application on ecosystem services, currently or in the future, to not be fully considered during the remedy selection process. This can result in: 1) unnecessary natural resource impacts; 2) implementation of remedies that create little or no benefit; 3) missed opportunities for environmental enhancement; and 4) a site closure approach that is not cost-effective. Net Environmental Benefit Analysis (NEBA), also known as Net Ecosystem Services Analysis (NESA), is a framework for measuring changes in ecosystem services associated with remedial alternatives. NEBA accounts for environmental management and regulation, and will be a bridge between ecosystem services and the reduction of associated risk.
Toxicology and omics: Bridging the gap between gene and whole animal responses.

PT131. A toxico-genomics and non-lethal approach to assess the impact of urban water pollution in wildlife.

L. Corto, U.S. EPA / Wildlife Ecology and Conservation; G.S. Toor, University of Florida / Soil Water Science Department; N.D. Denslow, University of Florida / Physiological Sciences

Urban surface waters frequently receive treated or untreated wastewater where endocrine disrupting compounds (EDCs) are commonly present. These EDCs have the potential to produce toxic effects in organisms at very low concentrations (μg/L to ng/L). We use a toxo-genomic approach to evaluate the potential impact of sub-lethal effects of pollution in water. Fish and birds were used as animal models to assess the effects of urban waters in our study. Gene expression microarrays (Fish) and RNA Seq (Birds) were used to determine the influence of exposures on animals. First, a 48-hour fish exposure was performed exposing fathead minnows to surface water. These urban waters altered transcription of cholesterol metabolism and DNA repair genes, and cause hypercholesterolemia in fish. These findings resemble the effects caused by perfluoroalky substances (PFASs) commonly found EDCs in urban waterways. To confirm the findings of the field study, we exposed fathead minnows during 48 h through water spiked with three different PFOS concentrations (0; 500 and, 25000 ng/L) and a mixture of PFAS. Later, we expose Red-Winged Blackbirds to similar concentrations for 96 h. Also, in order to explore a non-destructive method (more suitable for wildlife monitoring) we used blood as starting material for gene expression analysis. When compared with liver, the number of altered genes in blood was five times greater. The concentrations of PFASs used in this study altered DNA repair, lipid, mitochondrial and thyroid hormone metabolism gene expression in both fish and birds. Also, PFASs exposure led to up-regulation of estrogen receptor in both liver and blood in fish. These gene expression profiles fit into adverse outcome pathways suggesting sub-lethal effects on survival and reproduction on fish.

PT132. Hepatic gene expression profiling in zebrafish (Danio rerio) exposed to the fungicide chlorothalonil

A.S. Garayzar, CIAD, Unidad Mazatlan / ecotoxicología; P.A. Bahamonde, Canadian Rivers Institute / Biology; C.J. Martyniuk, University of Florida / Biology

Chlorothalonil is a fungicide widely used in agricultural crops around the world and as such, it is a prevalent aquatic pollutant. However the effects of this fungicide on non-target aquatic organisms have not been fully investigated. The aim of the present study was to (1) determine the effects of chlorothalonil toxicity on adult male zebrafish (Danio rerio) and (2) characterize the effects of chlorothalonil on gene expression patterns in the zebrafish liver using two different concentrations of the fungicide, 0.007 mg/l (environmentally-relevant) and 0.035 mg/l (sub-lethal). These concentrations were selected because range finding experiments showed that zebrafish survival was significantly different from controls at concentrations higher than 0.035 mg/L. Male zebrafish showed an increase in body length, weight, and condition factor with both treatments of chlorothalonil but a decrease in liversomatic index. A commercial Danio rerio microarrays (4x44k) from Agilent was used to identify patterns of gene expression in male zebrafish livers during a 96h toxicological assay. Microarray analysis performed in males exposed to 0.007mg/L and 0.035 mg/L of chlorothalonil revealed that individuals showed regulated transcriptional sub-networks that were related to cell division, reproduction, immunity, DNA damage and xenobiotic clearance. Vitellogenin was also induced in the liver of zebrafish, suggesting a potential estrogenic mode of action for this pesticide. This is the first study to demonstrate the potential estrogenic mode of action of the fungicide chlorothalonil in fish; however further studies must determine whether this is an estrogenic response or a response due to an anti-androgenic mode of action similar to other fungicides. This study also identifies hepatic molecular signaling cascades that are sensitive to chlorothalonil.

PT133. In-gel redox proteomics as a tool to evaluate protein modification and oxidative stress in bivalves, a new area of study in aquatic toxicology

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Aquatic pollution is a worldwide concerning theme, threatening both wildlife and human health. Contaminants can act as pro-oxidants, disturbing cellular homeostasis and promoting oxidative damage. It is known that reactive oxygen species can target proteins (e.g. causing protein carbonylation and thiol oxidation), a scenario enhanced during exposure to pollutants. Analysis of such modifications can help to identify potential target proteins, as well as, metabolic and cellular events under possible disruption. In this context, oysters Crassostrea gigas and Crassostrea brasiliana were exposed to zinc oxide nanoparticles (nZnO) and to sanitary sewage, respectively. Redox proteomics assays were conducted in different tissues. For Crassostrea gigas, after 48 h of exposure to 4 mg/L nZnO, 2DE SDS-PAGE, coupled to fluorescent tagging of thiol cysteic proteins, revealed a minor scenario of oxidative stress in gills: 17 proteins were sensitive to thiol modifications (reduction/oxidation), whereas 36 proteins exhibited carbonylation/decarbonylation events. In addition, analysis of mitochondrial proteins by 1DE SDS-PAGE coupled to fluorescent tagging indicated a more severe oxidative stress, with oxidation of 30-60% of protein thioles in gills and digestive gland. These data indicate that oxidative stress can be quite variable: bivalve mitochondria seem to be highly affected by oxidants through protein thioles, while in cytosol protein carbonylation can be relevant. For Crassostrea brasiliana, after 24 h of laboratory exposure to seawater collected from a sanitary sewage-polluted area in Bahiaform (Brazil), 1DE-SDS PAGE analyses of redox proteins revealed that the thioles were affected in digestive gills. Data indicate signals of moderate oxidative stress only in hemolymph, with oxidation of 42% of cytosolic total protein thioles. In addition, hemolymph contained 3 highly expressed proteins with thiol groups, all sensitive to sewage exposure. In vitro experiments also indicate that these proteins are susceptible to thiol oxidation by hydrogen peroxide. Although it has not been possible to run protein identification so far, both experiments point out the usefulness of redox proteomics analysis in bivalves exposed to environmental contaminants. This is a new area of study in aquatic toxicology, with increasing applicability due to recent availability of genomic and transcriptomic information of many bivalve species.

PT134. Metallothionein expression as biomarker for metal stress in Salmo salar

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Development of sustainable aquaculture requires analyses of effects of this economically important activity on its surroundings but also the effects of environmental changes on growth and health of the product. A common practice in salmon aquaculture is the use of anti-fouling paints used on nets for fish culture, thus reducing incrustations and improving water circulation inside the cages. The use of these paints may not only alter the chain of biological succession on the cages but also affect biodiversity of the whole area, including the cultured fish. To advance towards safer farming systems that depend on the awareness of environmental sustainability and knowledge what effect these products could exert on cultivated species we aimed at establishing metallothionein expression as heavy metal biomarker in Salmo salar. Metallothioneins are small cystein rich proteins of pivotal importance for metal homeostasis, in addition sequestering overload of metal ions as early response to metal stress. The effect of zinc was assessed in liver of juvenile S. salar. Fish were injected intraperitoneal with ZnCl2 (0.6 mg/kg) and controls with vehicle only for three consecutive days once a day, sacrificed on the fourth day, tissue extracted and total RNA was prepared (Chomzynski and Sacchi, 1987). Expression levels were analyzed by RT-qPCR with specific primers yielding unique amplicons previously confirmed by sequencing. The expression of the metallothionein gene (mt), vitellogenin (vg), cytochrome P450 (cyp1A) and nr2 was determined in liver by RT-qPCR normalized to elongation factor EFla. Clearly, mt expression was increased sixfold (P<0.001), while nr2 (P<0.085) and cyp1A (P=0.105) did not increase significantly, and vg did not show any changes. Hence, here we show a specific effect of Zn on mt transcripts in liver and no cross-talk to signaling pathways involving expression of vg indicative for estrogenic compounds, cyp1A for polyaromatic carboxylic acids, or transcription factor nr2 for oxidative stress.
respectively, in these experimental individuals. These results suggest that the analyses of mt expression in liver might serve as an indicator of metabolic stress in S. salar. We are actually assessing this biomarker in S. salar cultured in southern Chile to reveal biologically relevant effects of heavy metal exposure which might involve antifouling paints on nets used in aquaculture. Acknowledgement: DID-UACH-SE2015-02, MecesupAUS1104, MINECON

PT135. Molecular and biochemical response of the freshwater bivalve Diploidy chilenensis to experimental oxygen depletion

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Hypoxic conditions in freshwater and marine systems are spreading as a consequence of anthropogenic pollution and eutrophication. The freshwater bivalve Diploidy chilenensis is a key species for Patagonian lakes and rivers as important filter feeder involved in water clearance. We tested its biochemical and molecular response to 10 days of exposure to anoxia (0.06% air saturation), hypoxia (10% air saturation), and normoxia (control group). Both treatments had differential efficacy on relevant human disease markers such as glucose and glycine values. The bile and plasma of the common bivalve are important systems used to analyze biotransformation of chemicals. The objective of this study was to determine their impact on the vertebrate neuroendocrine system. The behavioral assay was performed using a novel tank test and the vertebrate neuroendocrine system. The behavior of the D. chilenensis was analyzed using a novel tank test and the vertebrate neuroendocrine system. The behavioral assay was performed using a novel tank test and the vertebrate neuroendocrine system. The behavioral assay was performed using a novel tank test and the vertebrate neuroendocrine system.

PT136. Transcriptome characterization of Nododipten nodosus by RNA-Seq

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Bivalves are used in monitoring programs as bioindicators of contamination. Nododipten nodosus is a scallop with rapid growth that has economic importance in southern Brazil showing great potential for biomonitoring. Although the de novo assembly of the genome of this species has been reported, there are no data available about the transcriptional response of this species under environmental stress. In this study, we aimed to sequence the genome of N. nodosus and to perform a transcriptomic analysis of the species under different environmental conditions, including hypoxia, anoxia, and normoxia. We used RNA-Seq technology to generate transcriptomic data and to perform a comprehensive analysis of the gene expression profile of the species under these conditions. The analysis revealed a differential expression of genes involved in the response to environmental stress, including genes related to the antioxidant defense system, energy metabolism, and cell signaling. These results provide new insights into the physiological mechanisms that allow Nododipten nodosus to survive under hypoxic conditions, and they support the use of this species as an effective bioindicator for monitoring environmental pollution.
obtain in the bile (ESI(-): 1478; ESI(+): 1379) than in the plasma (ESI(-): 163; ESI(+): 345). A consistent time and concentration-dependent response of significantly responding features was only observed in the bile of fish exposed at the highest concentration or at longer exposure time. Fish at 100 mg/L showed 23 and 64 responding features in positive mode and 23 and 52 in negative mode after 2 and 8 days of exposure, respectively. On the other hand, after 8 d of exposure, the significantly responding features were 34, 60 (positive mode) and 22, 17 and 52 (negative mode) in fish exposed to 0.01, 1.0 y 100 mg/L respectively. In both cases, at the highest concentration the profile was outweighed by up-regulated features. A clear dose response behavior was observed for the following features (M+ m/z: T= retention time (min)) in ESI(-): M324.2-T2.5; M770.6-T2.7; M 724.4-T8.7; M 679.0-T15.4 and in ESI(+): M733.4-T9.3; M615.4-T15.0; M599.4-T15.0; M658.4-T15.0; M570.4-T15. In the bile of fish exposed during 48 a clear dose response was observed in only one feature in ESI(-): M281.2-T15. In comparison with other studied pesticides, glyphosate has displayed a subtle disruption of the biofluid metabolome, even at relatively high concentrations. However, more persistent exposures should be tested in order to evaluate potential longer-term effects induced by this herbicide.

**Ecotoxicological effects of conventional and non-conventional petroleum extraction and waste**

**PT139. A Model to Predict toxicities of complex mixtures of Oils Sands Process Water?**

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Although naphthenic acids (NAs) are often cited as the major toxic chemical species in oil sands process-affected water (OSPW), currently there are no experimental data to directly support this hypothesis. The first attempt to remediate large volumes of OSPW is underway in the world’s first oil sands industry end-pit lake, called Base Mine Lake (BML). Knowledge of which chemicals cause toxicity in BML is therefore an important data gap as 40 million m³ of OSPW is monitored and it detoxification projected over many years. This talk will serve as an overview and update of a study where the objective was to identify dissolved organic chemical groups that are responsible for the toxicity of OSPW. Using repeated fractionations of the dissolved organic fraction from BML OSPW, an effects-directed analysis approach was used to narrow down the list of toxic suspects. A suite of assays including Microtox®, the fathead minnow embryo toxicity assay, and the Chromonums dilutus 96th acute toxicity assay were used to identify the most toxic sub-fractions. Chemical species in each fraction were classified by HPCL - Orbitrap mass spectrometry according to heteroatom empirical formula class in negative (-) and positive (+) ionization: O=ax(when x=1-6), N=ax(when x=1-4), SOx (where x=1-3), or NOxS+(where x=1-2). Results allowed a narrowing of putative toxic chemicals to a few chemical groups which will be discussed with respect to their overall environmental hazard, including their toxicity, bioaccumulation potential, and persistence.

**PT140. Linking chemical characteristics of NAs to the differential effects on exposure from development in the Western clawed frog (Silurana tropicalis)**

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Naphthenic acids (NAs) are carboxylic acids naturally present in crude oil. NAs have been detected in the water of the Athabasca River in Alberta, Canada. Furthermore, high concentrations of NAs have been also identified in sediments after major oil spills in United States and South Korea. The toxicity and effects of NAs on physical development are still unclear. The aim of this study was to assess the effects of two commercial NA (cNA) extracts on early embryonic development in the Western clawed frog (Silurana tropicalis) and characterize the extracts using a novel approach for the chemical analysis by Gas Chromatography Electron Impact Mass Spectrometry (GC-EMIS). After 24 hours of exposure to graded doses, the embryos in the 6 mg/L treatment were dead with the first cNA (cNA1), however, with the second extract (cNA2) the embryos at 6 mg/L were severely affected with abnormalities, but not all of them were dead. The effects of the exposure to NAs on the total length, snout vent length and tail length were significantly different between the controls and both cNA, and between cNA extracts at sub-lethal concentrations (1-4 mg/L; p < 0.05). The GC chromatograms revealed that 76% of the 224 peaks that were detected in cNA2 corresponded to NAs, meanwhile NAs were only present in 75% of the 178 peaks in cNA1. According to the ion distribution both extracts are mainly comprised by aliphatic NAs (z=0). Most of the components correspond to NAs with 9 and 10 carbons in cNA1, and 9 and 6 in cNA2. The results of this study suggest that the toxic effects observed in the embryonic development are related to variation in extract composition. Research on the relationship between chemical composition, and gene expression underlying morphological effects in S. tropicalis is ongoing. Supported by CONACYT (Mexico) and University of Ottawa Research Chair Program.

**PT141. Abiotic Factors and its Relation with the STX production in a Meso-Oligotrophic Subtropical Lake Dominated by Cylindrospermopsis raciborskii**

D.M. Breton: M.M. Petruccio, UFSC

Cylindrospermopsis raciborskii is a cyanobacteria capable producing toxins, among which Saxitoxin (STX). When this species is present in a freshwater ecosystem, it can change all trophic structure, supporting the bottom-up theory that is needed approach to explain the complexity regulation. In this context, our research was to identify, by the first time in situ, wich abiotic factors are related with STX production. We related physical variables, nutrients and chlorophyll-a concentration with STX concentration in a meso-oligotrophic subtropical lake dominated by C. raciborskii that supplies drinking water to around of 100,000 inhabitants. We developed a model using Generalized Linear Models - GLM with all variables measured monthly in a 45 months monitoring period. The significant variables found at this model were used to perform simple models aiming to understand the relationship of STX concentration in function of each variable. The higher STX concentration reported was 1.64µg L-1 and the average was 0.31±0.31 µg L-1. In situ, we found that the concentration of STX was related with abiotic factors. Conductivity, alkalinity and temperature were the variables with the greatest explanatory power on STX concentration in the studied lake (pseudo squared R=0.48). The STX concentration increased as function of conductivity and this variable alone explained 32% of the variation in STX concentration. Alkalinity explained 41% of the variation, but the relationship was inverse. Temperature alone was not significant (p=0.44). The ion concentration (related to conductivity and alkalinity) was directly related to STX concentration, in accordance with experiments in vitro previously described at the scientific literature. C. raciborskii cells exposed to stress related to higher ionic concentration appear to activate the biosynthesis STX as a response, since STX changes the cell permeability and may contribute to homeostasis of this organism. The relationship between temperature and STX concentration in the generalized model suggests that there might be a dependent relationship of the C. raciborskii density reflected in the STX concentration and this must be investigated. The models developed are not robust to make predictions but can help understanding the environmental factors associated with STX production and to minimizing the risks associated with this toxin. This models need to be tested in other freshwater systems aiming validate them.

**PT142. Development of a monoclonal ELISA based on a llama single chain antibody for the detection of microcystins in water samples**

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Cyanobacteria produce a wide spectrum of toxic metabolites, predominating microcystins (MCs), a family of over eighty cyclic heptapeptides with highly variable structure/toxicity ratio. Therefore, the analytical determination of MCs requires complex and high cost methods of high selectivity and specificity such as LC-MS/MS which difficult the implementation of monitoring programs. Since the determination of microcystins is critical for the protection of human and ecosystem health, there is a need to validate simple and low cost methodologies. In this work we report the development of a monoclonal ELISA using a single domain antibody isolated from a llama heavy-chain antibodies library. The developed ELISA was highly sensitive and specific for MC-LR and other
Arginine containing variants. We used a collection of thirty environmental water samples containing a wide range of MC concentrations (undetectable up to 16000 µg/L) to compare the results of this monoclonal ELISA with a previously developed polyclonal ELISA and with LC-MS/MS. The ELISAs are very simple, do not require costly equipment and provide a response towards different MC variants, according to the specificity of the antibody. As expected, the polyclonal offers a wider range of detection for different MC variants but lower selectivity than the monoclonal assay. Also, the monoclonal ELISA showed lower limit of quantification than the polyclonal (LOQ for LR polyclonal 0.2 µg/L; monoclonal 0.1 µg/L) while the analytical methods have higher LOQ for direct, non-concentrated samples (LC-MS/MS: 10 µg/L for LR and 1 µg/L for RR). Both ELISA methods were highly correlated to LC-MS/MS. The correlation of the ELISA with the expected values according to LC-MS/MS was very good for the polyclonal (r = 0.921) and outstanding for the monoclonal (r = 0.993). Moreover, the monoclonal evidenced a striking selectivity, which makes it the ideal option for screening purposes.

PT143. Ensayos de remoción de Microcistina en agua de proceso

M. González, A.N. Martín, Agua y Saneamientos Argentinos / Dirección Técnica y Desarrollo Tecnológico

En los afluentes al Río del Plata, se detectó durante los últimos 10 años, mayor frecuencia en floraciones cianobacterianas potencialmente toxigénas. Por ello atendiendo a la necesidad de potabilización y distribución de agua segura, la Empresa AySA realiza monitoreos de esta fuente de provisión de agua. Complementariamente diseñó y llevó adelante ensayos que permitan comprender y evaluar la dinámica de la toxina microcistina (MC-LR) disuelta en agua, para estudiar los tiempos óptimos para la remoción de la misma mediante oxidación por cloración durante la potabilización. En estos estudios se pusieron énfasis en el impacto de la presencia de Anomia en el agua clorada, en cuanto a la efectividad de remoción de microcistina, y la potencial formación de subproductos de cloración. Se realizaron ensayos de laboratorio en distintas condiciones de agua de proceso, a distintos pH y con distintas concentraciones de cloro libre, con y sin Anomia. Se utilizó toxina MC-LR obtenida en trabajos previos a partir de cianobacterias recolectadas en el Río del Plata. En una primera oportunidad se inocularon diferentes concentraciones de Microcistina-LR en agua desionizada, con una concentración de MC-LR de 3.6 µg/L, 4mg/L de cloro activo, pH de la solución ≈ 7, y habiéndose efectuado mediciones de concentración de MC-LR y cloro libre, se obtuvieron resultados que indican que para lograr la eliminación de la MC-LR en estas condiciones, son suficientes 20 min de contacto con cloro. Para obtener resultados mas representativos de la dinámica de la toxina disuelta en agua de proceso, se repitieron los ensayos anteriores, utilizando agua filtrada de PGSM. En esta matriz se realizaron dos tipos de ensayos: en 1°, se analizó solo el efecto de la cloración en la remoción de toxina; y en el 2° se realizó el mismo análisis, pero efectuado con agua desionizada. En el 1° caso los resultados permiten simular una concentración que satisface el Breakpoint. En ambos casos, se determinó que en dichas condiciones, son suficientes 30min de contacto de cloro con dichas soluciones, para lograr la remoción total de MC-LR. Estos resultados preliminares brindan herramientas para lograr un mejor análisis de las etapas de proceso.

PT1144. Study of toxicity of Microcystin and Saxitoxin on Ceriodaphnia dubia before and after treatment with ultrasound

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Currently, it is reported in the literature the proliferation of potentially toxic cyanobacteria in fresh water and its consequences for the environmental and human health. Given the above, the objective of this research was to evaluate the potential effectiveness in the use of ultrasound to reduce toxicity of cyanotoxins (microcystin (Mic) and saxitoxin (Sax)) produced by two proven producing species: Microcystis aeruginosa and Microcystis yezoensis, by means of a monoclonal antibody. Therefore, we used acute and chronic toxicity tests with Ceriodaphnia dubia test organism (NBR 13373, 2011) at concentrations allowed by Brazilian law and concentration 5 times exceeding the permitted. In order to obtain the toxins, there were collected surface samples of phytoplankton, isolated and axenized, the species were grown in 9L polycarbonate bottles in medium ASM-1 and pH 7 (SL), and then centrifuged at 2500 rpm for 20 min to concentrate the samples. Subsequently, the cultures were concentrated in continuous-flow refrigerated centrifuge at 6000 rpm and 25 ml/min. The biomass obtained was frozen in liquid nitrogen and lyophilized. The analysis of cyanotoxins was performed by HPLC according to methods described by Ferrão-Filho et al., (2009), and analyzed Mic as Spoo et al. (2003), Sax according Oshima (1995) and cylindrospermopsins according Eaglesham (1999). For the achievement of the toxicological experiments, stock solutions were prepared in duplicates at concentrations of 0.02 g L⁻¹ Mic and 0.04 g L⁻¹ Sax and each one sonicated for 5 min with 40W power. The organisms were exposed to concentrations of 1 mg.L⁻¹-Mic, 1.5 and 7.5g.L⁻¹-Sax. There were carried out statistical analysis, t-test with the Bonferroni adjustment (reproductive parameters) and Kruskal-Wallis test (mortality) to assess the potential acute and chronic toxicity of tests. Concentrations were found 440mg.ml⁻¹ Mic and 48mg.ml⁻¹ Sax. It was noted that the not sonicated solutions had acute toxicity in trials with Mic and chronic toxicity Sax. After treatment with ultrasound, there was no significant difference between the control and concentrations tested. Therefore, the remediation cyanotoxins by means of ultrasound was efficient. However, further testing on higher concentrations representing actual environmental conditions, different times and sonication power, and the use of organisms other tests are necessary to better assess the remediation of these toxins.

PT145. Water quality and depuration of cyanobacterial paralytic shellfish toxins

S. Calado, Farmacología: J. Wojciechowski, Federal University of Paraná; V. Freitas et al. (Morogónes), Universidade Federal do Rio de Janeiro; H. Silva de Assis, UFPR / Pharmacology

Cyanobacterial blooms in the reservoirs affect the health of human population and aquatic communities due to the ability of these microorganisms to produce toxins. The PSTs (paralytic shellfish toxins) are neurotoxins that block sodium channels preventing the transmission of nerve impulses. The Alagados Reservoir, South Brazil, provides recreation areas for fishing and boating and supplies drinking water for three cities. Since 2002 the algae blooms and PSTs has been detected in this water body. The aim of this study was to monitor the water quality of the Alagados Reservoir and to evaluate the potential depuration of xenobiotics from freshwater fish Geophagus brasiliensis. Water and fish were sampled two points of the reservoir in September 2013 (dry season) and March 2014 (rainy season). Water samples were used to qualitative and quantitative analyses of phytoplankton, and quantification of cyanotoxins. The fish were divided into two groups. The first one “site groups” was euthanized after the sampling. The liver tissue was removed. In order to control the potential toxic effects and depuration through biochemical biomarkers such as ethoxyresorufin-O-deethylase (EROD), superoxide dismutase (SOD), glutathione peroxidase (GPx), glutathione reduced (GSH), liperoxidation (LPO) and protein carbonylation (PCO). Muscle samples were also removed to quantify PSTs. The second one “deparation groups” were submitted to depuration experiment for 40 days in clean water. After that, the same procedures of the first group were carried out. Cylindrospermopsis raciborskii showed high dominance and the densities corresponded to values above the recommended limit by Brazilian legislation (20.000 cells.ml⁻¹). The PSTs concentrations in water were also found in the reservoir in both seasons. Saxitoxin and GTX 2 were detected in the fish muscle samples. GTX 2 concentration increased in the “deparation groups” compared to “site groups”, suggesting the transformation of STX in GTX 2. The biochemical biomarkers showed differences between two fish groups. These differences found in the two sampling points and seasons suggested the recovery of the antioxidant system and a reduction of cellular damage in fish after 40 day in clean water. The Alagados Reservoirs is contaminated by PSTs and the monitoring of the water quality is essential to minimize the risks to the human health and to the aquatic environment.

PT146. Toxins in the cyanobacteria Radiocystis fernandoi: bioaccumulation and biochemical and histopathological effects on fish.

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The presence of cyanobacterial blooms interferes directly in water quality and may cause negative effects on the aquatic and terrestrial biota, including the humans. In the last decade, the occurrence of the genus Radiocystis in Buenos Aires 2015 SETAC Latin America 11th Biennial Meeting Abstract Book 39
“Río Uruguay” (Digesto). En el Tema E 3: Contaminación, del Digesto, Título 2: De la prevención en materia de contaminación, en los Capítulos 4, 5 y 6 se encuentran la clasificación de las aguas, los estándares de calidad de las aguas, las condiciones de los efluentes, de las descargas y de los vertimientos. Asimismo, en el Tema E4: Conservación y Preservación de los Recursos Vivos, Título 1: Disposiciones Generales, Capítulo 2 se encuentran los propósitos relativos a asegurar el uso sustentable de los mismos, así como promover y coordinar la investigación científica en materia de recursos vivos. El objetivo del presente trabajo es describir las principales acciones relacionadas a la gestión ambiental y al monitoreo del Río Uruguay llevadas a cabo por la CARU. Se incluyen en este análisis las principales actividades del “Programa de Vigilancia y Estado Tóxico del Río Uruguay” y del “Programa de Conservación de la Fauna Íctica y los Recursos Pesqueros del Río Uruguay” de la CARU. Ambos programas poseen entre sus alcances la interacción permanente con municipios, intendencias, universidades, dependencias de turismo, ambiente y salud de Argentina y Uruguay. Los análisis químicos y biológicos de las muestras son realizados por reconocidos laboratorios públicos principalmente de las Universidades de Argentina y Uruguay, bajo métodos estandarizados. Se difunden los resultados del monitoreo y de las investigaciones a través de diferentes medios. Se lleva a cabo capacitación en materia de floraciones algicas nocivas, así como sobre la metodología empleada ante mortalidades de peces. A partir del año 2014 la CARU ha comenzado a desempeñar un importante rol de coordinación de investigaciones de alto nivel y a fomentar la arousa de las universidades argentinas y uruguayas.

**Becoming Tripartite Collaborators: Dialogue to Bring Academia, Business, and Government Science Professionals Together**

**PT147. Chemical Pollution in developing countries and Multilateral environmental agreements: an opportunity for tripartite cooperation**

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Chemical pollution is a growing concern particularly in developing countries since monitoring strategies are usually not in place. Multilateral environmental agreements aimed to reduce the toxic load in our environment are entitled to eliminate and reduce the persistent chemicals occurrence in our environment. Since many chemicals during their life cycle ended up in one way or another in different environmental compartments (i.e. soils, sediments, biota), our perspective should address the issue of multimodal contamination of nature, but also on how we regulate their life cycle by minimizing the negative impacts over the human health and the ecosystems. How can we do that with million of chemicals being used in the market nowadays? The current a posteriori approach have been instrumental in reducing the risk derived from persistent chemicals including POPs and mercury. The Stockholm, Basel and Rotterdam conventions have been so far very effective in reducing the global use of toxic chemicals (such as PCBs and chlorinated pesticides), as monitoring data reflects during the last 10 years. SAICM the strategic approach for international chemicals management established in 2006 have also contributed by raising concern on chemicals of emerging concern related issues. But does the current approach respond to the need of sustainable development?, the answer is that this chemical by chemical approach would not be efficient enough in controlling chemical pollution. Priorization should be established for chemicals monitoring of the many new chemical threats, as well as to realize the new opportunities arising from this challenge, among them a) technical scientific (such as green chemistry, ecodesign, biorefineries), b) strategy policy approaches (c) Stakeholder sensitization - to showcase the evidence and help bring more attention to how the ecosystem services as a whole (provisioning, regulating, supporting and cultural (aesthetic, spiritual appreciation, recreation etc) are diminished by chemical pollution. Both the industry and governments in developing countries should move also towards this objective considering that now the chemicals production have shifted to such countries. Supported by FONDECYT 1140466 and FONDAP CRHIAM 15130015.

**PT149. SETAC: contribution académica al modelo triple helicoidal con la industria y el gobierno para el cuidado Ambiental**

J. Herkovits, Fundacion PROSAMA / Institute of Environmental Sciences and Health

La relación entre los científicos y la industria o el gobierno es de antigua data con casos de éxito muy renombrados como el de Arquimedes y Pasteur. Para la protección ambiental SETAC ha reconocido desde su fundación que es necesario una cooperacion entre el sector productivo, gubernamental y académico no solo para generar normativas ambientales apropiadas sino proyectos cuya envergadura muchas veces exceden los alcances y posibilidades de cada sector por separado. La vision tripartita de SETAC para la protección ambiental ha sido adoptada en muchos países y de hecho es dominante también en Naciones Unidas. Este concurso contrasta con las situaciones de severa contaminacion ambiental que se registra en la mayor parte de los países en desarrollo. Sin duda ha habido una enorme concientizacion ambiental durante las últimas décadas y el sector cientifico ha crecido en forma notable: por ejemplo la Argentina ocupa el 6to lugar mundial en crecimiento de trabajos cientificos en el tema ambiental. En este contexto es tambien notable el crecimiento de la capacidad y oferta del sector académico en los ultimos años en las latinoamericanas y asiaticas y tambien el incremento de instrumentos de financiamiento potencialmente disponibles. Los resultados sin embargo para mejorar nuestra calidad ambiental son aun magros. Desde ya que es recomendable un mayor esfuero participativo del sector académico y perfeccionar algunos aspectos que son de su exclusiva responsabilidad v.g.: i) mayor difusion de informacion cientifica ambiental relevante para la comunidad en un idioma facilmente comprensible; ii) mayor participacion para establecer normativas para el cuidado ambiental (v.g en Argentina los estudios ecotoxicologicos y el analisis de riesgo aun no son de aplicacion para el cuidado ambiental); iii) mayor transparencia en la asignacion de recursos (v.g. informes anonimos que desacreditan proyectos sin fundamentacion generando una profunda desigualdad de oportunidades); iv) mayor compromiso academico con el derecho ambiental; v) mayor presencia de los científicos en los partidopoliticos para priorizar el tema ambiental como politica de estado. SETAC puede darse el marco de coordiacion para cumplir con estos objetivos. Perfeccionando nuestro sector, sin duda vamos a contribuir en forma mas significativa con el cuidado ambiental. El modelo triple helicoidal de SETAC academia, gobierno y sector productivo asociado a las ONG y otros grupos de interes permitiran alcanzar el anhelado desarrollo sustentable.

**PT148. Programas de Monitoreo Ambiental de Playas y Recursos Ícticos llevados a cabo por la Comisión Administradora del Río Uruguay**

M. Bazzolo, J. Basig, P. Ojeda, H. Procuna, N. Rougier, Comisión Administradora del Río Uruguay / Secretaria Técnica

El Estatuto del Río Uruguay, acordado por la República Argentina y la República Oriental del Uruguay el 26 de febrero de 1975, establece a la Comisión Administradora del Río Uruguay (CARU) entre otras, la función de dictar las normas reglamentarias sobre varios temas, como por ejemplo la prevención de la contaminación, la conservación y preservación de los recursos vivos. Dichas normas, junto con otras, integran el Digesto sobre el Uso y Aprovechamiento del
and, consequently has remained out of service. The property is surrounded by the municipal velodrome, houses, a veteran’s centre, and a secondary level school and training. This processing plant had its construction in the heyday of the railway workshops, being built by England. Today disuse and neglect, leading to significantly lower living building conditions, where they are still fluid received from the workshops. At first glance it can be seen filtering liquids. For a long time it has been used as a landfill then environmental liabilities increased further aggravating the situation. It was never involved nor treaty, thereby requiring early intervention since it is suspected, from data supplied by staff acting on the plant, that part of the liquid remain flooded to a collector pipe that leads to the Matanza Riachuelo Basin. After a thorough environmental impact study, neutralization of the material found in the pools and silos that are localized proposed open pit is recommended. The situation analysis concludes that the ground has to be remedied and healthy while the municipal government examines the proposal to build in that area pools for social use, not contemplating remediation itself. As for the environmental and health damage, the waste cause: the invasion of pests, air pollution and generation of leachate that contaminate groundwater. Proposals are to persuade authorities to apply preventive measures, the cleaning of the property, remediation of soil vapour extraction methods, ventilation and proper removal and disposal of waste before consider any other use of the area.
TP001. Avaliação Do Teor De Matéria Orgânica Nas Micro-Bacias Do Rio Do Coxo E Rio Ipiracu-Mirim, Jacobina, Bahia, Brasil.

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The teor of matéria orgânica presente em solos, sedimentos e águas exerce um papel importante nos ecossistemas, uma vez que são capazes de conter compostos ou elementos químicos potencialmente tóxicos dissolvidos ou adsorvidos. O presente estudo teve como objetivo avaliar riscos ecológicos a partir do teor de matéria orgânica nos sedimentos superficiais das microbacias do Rio do Coxo e Rio Ipiracu-Mirim, em Jacobina, Bahia, Brasil. Para tal, foram delimitados cinco pontos de coleta ao longo de cada uma das micro-bacias, georeferenciados com GPS Garmirm, modelo GPSMAP78. Os sedimentos superficiais foram coletadas na camada 0-10 cm, através de pá plástica. Em Laboratório, o material foi secado em estufa por 48 horas a 60°C. As análises foram realizadas através do método da calcinação, utilizando-se a fração em nata (< 2 mm). Para tal, 2g do material foi levado a mufa à 500°C, permanecendo 6 horas. As massas foram repesadas, sendo que a diferença corresponde à matéria orgânica perdida durante a ignição. Os resultados revelaram que as taxas de matéria orgânica nos pontos da micro-bacia do Rio do Coxo foram 0,49%, 0,23%, 0,11%, 0,11% e 0,06%, enquanto que nos pontos do rio Ipiracu-Mirim as taxas foram 0,06%, 2,4%, 2,6%, 3,2% e 2,9%, respectivamente. Embora o teste estatístico de Kruskal-Wallis não tenha demonstrado diferenças significativas entre as médias encontradas para ambas as micro-bacias, Ipiracu-Mirim apresentou a maior média de matéria orgânica. Pode-se afirmar que essa diferença decorre do fato do rio Ipiracu-Mirim receber os efluentes produzidos no município de Jacobina, já que este não dispõe de estação de tratamento de efluentes (SANTOS, 2015).

Desta forma, boa parte da matéria orgânica presente em Ipiracu-Mirim é de origem alóctone, enquanto no rio do Coxo, por estar em área preservada é prioritariamente autóctone. Conclui-se que a micro-bacia do Rio Ipiracu-Mirim apresenta maiores riscos ecológicos, uma vez que maior taxa de matéria orgânica possibilita maior retenção de poluentes, a exemplos de metais pesados.

TP002. The concentration of heavy metals in dissolved fraction from Ipiracu Mirim River in gold exploration area in Jacobina, Bahia, Brazil

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The city of Jacobina is known as “City of Gold” by the mining history and also for having in its territory a multinational engaged in the mining of this metal. Through the center of the city crosses the Ipiracu-Mirim River, which in 2011 was considered by the SOS Atlantic Forest the second most polluted river in Brazil. The objective of this study was to evaluate the concentrations of heavy metals Cd, Cr, Cu, Hg, Ni, Pb, and Zn in the dissolved fraction of that river. The samples were collected in the superficial portion in five points, in November 2013, February, May and November 2014. In the laboratory the samples were filtered and acidified. The Cd, Cr, Cu, Ni, Pb and Zn analyses were performed using ICP-OES, while Hg was analyzed by Hg Quick Trace M-7500. The samples were analyzed in triplicates and we used certified standards for accuracy tests. It was used as reference the limits established by the Resolution CONAMA 357/05 for fresh water class II. The Cd and Cr elements were below the detection limit in all samples. The Cu overstepped the limit of 0.009 mg.L-1 only in May 2014 collection at three points. The Pb was at concentrations below the maximum allowed limit. The concentration of Ni overstepped the law to the third collection in a single point. The Zn was above the tolerated limit only on the November 2013 collection, on the spot with increased release of sewage into the river. The Hg element overstepped the law in all samples, and the last two all points showed concentrations above the limit of 0.2 microg.L-1. It was concluded that there is a need for greater oversight about the mines in the region, because of the risks that this practice offers to the biota and the human population.
Avaliação de qualidade do solo através da atividade da fosfatase alcalina

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O uso de bioensaios ecotoxicológicos tornou-se uma alternativa para investigar os efeitos de poluentes ambientais nos ecossistemas terrestres.Dentro destes poluentes, o carvão mineral merece destaque devido a sua constituição complexa, contendo hidrocarbonetos pesados, elementos metálicos e enxofre. Esta rocha é formada a partir de sedimentação de resíduos orgânicos, que são extraídos pelo processo de mineração. O objetivo deste estudo foi avaliar a toxicidade da fração solúvel em água do carvão mineral utilizando ensaios de toxicidade aguda em sementes de alfale (L. sativa) e isópodo terrestre (Armadillium vulgare). As sementes de alfale assim como os isótopos terrestres foram expostos a diferentes concentrações de carvão diluído em água mineral (1g/L/0.5g/L/0.1g/L/0.05g/L) além do controle. A taxa de germinação das sementes foi analisadas diariamente até o quinto dia, e ao fim do experimento foram registrados o peso seco e fresco. Para os isóspodos foi analisada a taxa de mortalidade após cinco dias. Ambos os ensaios foram realizados em incubadora a 25 °C, no escuro, seguindo recomendações de Da Silva Junior et al (2014). Também foi realizada a análise de metas da fração solúvel em água da amostra de carvão através de métodos tradicionais de espectrofotometria de Absorção Atômica. O perfil metalógico da amostra de carvão demonstra altas concentrações de contaminantes metálicos, potencialmente tóxicos: cobre (17.0mg/kg); chumbo (75.0mg/kg); níquel (14.5mg/kg); mangânese (56.5mg/kg); cromo (33.0mg/kg) e ferro (1466.0mg/kg). Para as sementes de L. sativa a exposição causou alteração entre todos os parâmetros analisados em comparação com o controle, mas sem diferenças entre as concentrações testadas. No ensaio de toxicidade aguda com A. vulgar, apenas a menor concentração causou mortalidade acima do controle. A toxicidade para os dois bioensaios parece estar relacionada a forte presença de metais tóxicos na fração solúvel em água do carvão mineral.

Disposal of dredged sediments in tropical soils: ecotoxicological evaluation based on bioassays with springtails and enchytraeids

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Metal reference values established in Brazilian legislation for terrestrial disposal of dredged sediments and soil quality were used for temperate regions. To evaluate the adequacy of such metal reference values to tropical soils, the ecotoxicity of a dredged sediment (from the Guanabara bay, Rio de Janeiro, Brazil) was investigated in two local soils (ferralsol and chernosol) by performing avoidance and reproduction tests using Folsomia candida and Enchytraeus crypticus. Test doses consisted of 0, 1.25, 2.5, 5, 10 and 20%. Total and potentially bioavailable metal concentrations were determined in the test mixtures. Although the chernosol mixtures had the highest total metal concentrations, the influence of the expansive clay minerals (with high ability to adsorb metals) and the high amount of nutrient typical from this type of soils seems to reduce the ecotoxicity. Collembolan avoidance behavior was the least sensitive endpoint. The lowest sediment doses increased the reproduction of F. candida in ferralsol mixtures. E. crypticus reproduction in the ferralsol mixtures were more pronounced at lower concentrations than in chernosol mixtures. Possibly the low nutrient content of the ferralsol, in connection with the addition of small amounts of sediment, created particular conditions that promoted reproduction of the test species. Data obtained in the ecotoxicological tests may support the establishment of a "safe" ecological dose of dredged sediments to be applied in tropical soils, supporting decision-makers in programs of environmental management.

Avaliação ecotoxicológica do solo com diferentes doses de cinzas de biomassa florestal

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Effects of pesticides used in a tropical agricultural field to terrestrial invertebrates

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Pesticides are widely used in agricultural fields and the unknown consequences of releasing these compounds into the environment are a matter of concern. The purpose of this study was to examine the direct impact of one insecticide/acaricide (KR 976C) and its active ingredient (abamectin) on non-target terrestrial invertebrate species. The chosen pesticide is widely used to control acari infestation in a strawberry agricultural field located in the south of the Minas Gerais state, Bon Repouso city, Brazil. Ecotoxicological assays were
used to evaluate the acute and chronic toxicity in portworns (Enchytraeus crypticus), collembolans (Folsomia candida) and mites (Hypoaspis aulefer). Soil test was collected from a reference area in Bom Repouso and spiked in the laboratory. The obtained results showed a concentration-effect pattern demonstrating the relevance and utility of the ecotoxicological approach using these species to assess the potential risk of pesticides in the terrestrial environment.

TP010. Prevalence of lead exposure in waterbirds in Durango, Mexico
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Lead exposure in migratory waterbirds is a problem that has been studied for many years and it has been estimated that tens of millions waterbirds die every year all around the world due to lead poisoning. Lead is used as pellets for shotguns during hunting season and those pellets remain in the environment as a source of pollution in marshes and other sites where waterbirds winter in Mexico. Lead pellets sink and are buried in mud from lakes, marshes and even on cropland soils that may be ingested by waterbirds while feeding and are craked in the gizzard where gastric fluids and crushing make lead readily absorbed into the blood system. Lead is carried from the blood to some organs such as liver, kidney and bones that can compromise bird’s health in the long term. So, it is important to study the prevalence of lead exposure in different sites where hunting for waterbirds is allowed. The goals of this study were to determine if lead exposure in waterbirds exists in a nearby marsh to the city of Durango, Mexico and estimate its prevalence based in lead contents in liver tissue and gizzards of waterbirds. We collected 97 tissue liver samples from Cinnamon Teal (Anas cyanoptera, n=4), Northern Shoveler (Anas clypeata, n=24), Green-winged Teal (Anas crecca, n=9), Mexican Duck (Anas platyrhynchos dixi, n=11), American Wigeon (Anas strepera, n=6), Blue-winged Teal (Anas discors, n=8), Snow Goose (Chen caerulescens, n=26), Ross’s Goose (Chen rossi, n=4), Black-necked Stilt (Himantopus mexicanus, n=1), Short-billed Dowitcher (Limnodromus scolopacens, n=3) and American Avocet (Recurvirostra americana, n=1) during the hunting seasons from 2010 to 2014. We quantified lead levels in liver tissue using an atomic absorption spectrophotometer. We also inspected gizzard contents in order to find lead pellet fragments. Most of the individual concentrations (97.93%) were below 2 ppm (fresh weight) showing no threat for waterbirds. However, some birds had higher values, mostly of Blue-winged Teals and Mexican Ducks. Based on these results we found a prevalence of 2.07% with subclinical lead values. We found pellet fragments in only one Snow Goose, for a prevalence of 2.08% from 48 gizzard contents analyzed. Prevalence values suggest that there is some risk of lead poisoning at subclinical levels for migratory waterbirds during their wintering stay at the study site but the risk can be increased if preventive and corrective measures are not implemented, especially the banning of lead in shotgun shells.

TP011. Rapid bioassays for assessment of recovery process in a coal mining area
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Coal mining is an important practice for the regional and national economy, because the country has large reserves of this ore. But the open pit mining can reveal risks to the ecosystem in which it operates, due to contamination resulting from coal extraction activities. The objective of this study was to evaluate, in a preliminary way, the risks of contamination of an area of environmental liability in a mining area, using ecotoxicity tests. Soil samples were collected from two areas: soil of an old abandoned mining area and no recovery (C1) and ground control distant 10 km from the mining area (C0). The collected soil from each site was screened separately, which was removed stones, roots and compacted blocks. Then 10 replica divided into standard-sized containers, divided into equal parts with 350g of the soil in each side (C0 and C1). The leakage bioassays were performed with earthworms (Eisenia andreoi) and terrestrial isopods (Armadillidium vulgare) Ten test organisms were added to each container, containing 5 replicates. After 24 hours in an environmental chamber at 25 °C, it was observed that there was a preference in both species toward the control soil (C0), to give the 87% drain percentage to Eisenia andreoi and 98% to Armadillidium vulgare. These preliminary data show the toxicity of the soil of abandoned mining area for two species demonstrating the negative impact of the extraction of coal on the biota, suggesting that further studies are developed using other bioassays of toxicity and evaluation studies in situ in the region, including research areas in recovery process to evaluate the effectiveness of environmental recovery processes.

TP012. Toxicidade de contaminantes emergentes (antibióticos) utilizando os ensaios de germinação em alface Lactuca sativa.
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The use of bioassays rapid for detection of alterations caused by agents toxic in the environment has been used frequently in studies of diagnostic and monitoring. Among the contaminants of great interest is the study of the antibiotics (antibiotics), which are widely used and can cause significant degradation in some ecosystems. We used the bioassays of seedling emergence of Lactuca sativa, to evaluate the resistance to antibiotics (antibiotics) in aqueous suspended solutions of the most commonly used antibiotics (amoxicillin, cefoxitin, ceftriaxone and cefazolin). The objective of this experiment was to investigate a fitotoxicity of contaminants emergentes (antibiotics) using the assénios of germination in alface Lactuca sativa, sorbed in sediment, producing a significant degradation in the control soil. Sediments were tested in a laboratory. The obtained results showed a concentration of 100% in sediments 10 days, as well as the control negative in 6 replicates, solubilizados in água destilada. The sementes were lavadas em solução de hipoclorito de sódio comercial (6%) por 30 minutos and enxaguadas in água corrente. Em cada placa de Petri contendo papel filtro foram adicionadas 25 sementes e 3 mL of solubilizado. Diariamente até o quinto dia, foi registrada a taxa de germinação. Os bioensaios devem ser realizados no escuro and em temperatura controlada (25 °C +/- 1 °C). As concentrações (2,5% , 5%, 10%, 25%) não tiveram alterações significativas, já na concentração de 50% teve mortalidade total nos antibióticos Cefadroxil, Ceftriaxone and Cefazolin. The obtained antibiótico Cefazolin havia uma baixa taxa de germinação mas que representou uma diferença significativa. Diante destes resultados concluímos que os 4 antibióticos testados possuem baixa fitotoxicidade e que o antibiótico Cefazolin é menos tóxico in relação ao demais testados.

Importance of microplastics as environmental contaminants of regional and global concern
TP013. Accumulation of microplastic in fish tissues and its effects on the immune system
B. Jovanovic, Ludwig Maximilians University of Munich / Chair for Fisheries Biology and Fish Diseases

During the course of 45 days seabream (Sparus aurata) was fed with seven different types of microplastic (1 mg/kg body weight daily) which was mixed with the fish feed. The exposure was followed by 30 days of depuration period. At days 45 and 75 quantity of microplastic particles was assessed in the intestines, liver, and kidney. Blood smears were taken for blood cell count analysis, and samples of intestine, kidney, and liver were taken for sectioning and histopathology analysis. In a separate experiment, the effect of polystyrene (PS) and polycarbonate (PC) particles on the innate immune system of a fathead minnow (Pimephales promelas), was examined using neutrophil function assays. To determine the effects of PS and PC on the innate immune response in vitro application of plastic particles on neutrophil oxidative burst, degranulation of primary granules, and neutrophil extracellular trap (NET) release assays were used. Application of both PS and PC (0.1 μg μl -1) each caused a significant stimulation of oxidative burst, degranulation, and NETs release of up to 30-100% increase compared to a non-treated control. This study outlines the important interaction between microplastic and the innate immune system of fish and indicates a potential for for plastic particles to interfere with immune cell function.

TP014. Effects of PVC and PE exposures in the stress response of marine mussel Perna perna
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Among all different pollutants, plastic debris is one of the main environmental impacts, found from beaches and mangrove to gyres in the middle of the oceans. Macroplastics, with size above 5mm, are the larger quantities but microplastics, fragments less than 5mm can be most harmful for filter feeding animals such as mussels and oysters. However, it is still debatable if its effects are physical, due to the increase in indigestible material; or chemical, due to plastic additives such as phthalates or PCBs. To study the impact that these particles can have in these animals, brown mussels Perna perna (Bivalvia) were exposed to two microplastics: white polyvinyl chloride (PVC) powder, used in the manufacture of several products; and polyethylene (PE) microbeads, used as abrasives in cosmetics. In one experiment the mussels were exposed to each plastic in two concentrations (0.5 and 2.5g/L) during 12, 24, 48 and 144 hours. A second set of mussels was exposed to the same concentrations and times but the plastics were leached/washed for 20 days in turbulent seawater before the assay, softening the effects of additives. After both experiments, the gills were dissected and the levels of lipid peroxidation and DNA damage were quantified. Exposure to PE and PVC had different effects in the stress response: lipid peroxidation levels were lower than controls for PE whereas for PVC the opposite was observed. The factors contributing to these results were different too: time of exposure and concentration of microplastics were the main influence to the response in PE exposed organisms while the leaching treatment was the most important for PVC. Results in DNA damage were different as well. In 24h, organisms exposed to PE showed more damaged DNA than control, but these were lower with PVC. For the times of exposure that followed, the levels of damage were the same as the controls, with exception of an increase in the PE exposure after 144h. The concentration of microplastics had a significant role in DNA damage response of P. perna for both types of plastic. Leaching treatment for PE and time of exposure for PVC influence the results as well. Our observations show that microplastics can affect P. Perna, leading to DNA damage and increased lipid peroxidation. Nonetheless, the stress response can vary greatly with the combination of different scenarios of exposure and factors that organisms are subjected.

TP015. Investigation of the effects of microplastics and bioavailability of toxicants associated with microplastics in the blue mussel, Mytilus edulis

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Plastic debris are present in marine environments on a global scale and the environmental effects of these materials on marine ecosystems is an international issue. Microplastics (pieces of plastic < 5 mm) are the most abundant size of plastics detected in marine environments, they are readily ingested by marine organisms, and concerns exist regarding their potential to affect organisms negatively. Among the factors that influence effects of microplastics on organisms after ingestion are gut retention time, disruption of gut physiology, and the potential for microplastics to transfer sorbed toxicants (co-contaminants) to organisms. Hydrophobic pollutants, such as polycyclic aromatic hydrocarbons (PAHs), can be sorbed to microplastics and desorption of PAHs from microplastics after ingestion by organisms is of toxicological concern. To understand the significance of this environmental issue, the potential for sorbed co-contaminants to become bioavailable after microplastic ingestion is necessary. The objective of this study is to evaluate the potential for ingested microplastics to transfer bioavailable PAHs to the mussel Mytilus edulis. This project aims to establish standard procedures for microplastic exposure experiments using mussels, together with procedures for the detection of bioavailable co-contaminants in mussel tissues. Our approach is to use expression of the cytochrome p450 1A gene (cyplA) as a biomarker of exposure to bioavailable PAHs and to assess the bioavailability of phenanthrene and pyrene associate with PVC microplastic particles. This study will contribute to a better understanding of the fate and effects of co-contaminants sorbed to microplastics in the marine environment.

TP016. Microplastics on recreational beaches in Punta del Este (Uruguay): unseen critical residents?

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Plastic is cheap, durable, versatile, and ‘essential’ for modern life. However, waste mismanagement (inadequate recycling and individual behaviors) caused the widespread occurrence of plastic in our environment. Plastic debris and microplastics are an aesthetic problem, but nowadays its adverse effects on biota are undeniable. Microplastics (plastic fragments or manufactured micro-particles, < 5mm) proliferate, migrate and accumulate in habitats worldwide. With similar sizes than food items, microplastics are ingested and accumulated by invertebrates and vertebrates, causing asphyxia, reduced nutrient assimilation, and obstruction/perforation of digestive tracts. However, less is known about the absorption of plastic additives (phthalates) or hydrophobic pollutants adsorbed onto ingested debris (persistent organic pollutant, POPs). Microplastic has become a global environmental hazard. The total contribution of tourism to Uruguayan GDP was 8.6% (2013), with 87% due to coastal tourism essentially based on beaches. Nonetheless, there is no published report on microplastics pollution for Uruguayan beaches. Therefore, we assessed the accumulation of plastic and microplastics debris, including POPs analysis, in an iconic touristic destination: Punta del Este (34°58’5.045°37’W). Ten snapshot sampling sites were chosen, covering beaches in both sides of the peninsula (i.e. SW: Mansa, NE: Brava). Three 2x2m quadrates were randomly selected along the strandline at each site, and the first 2cm of sediments were sieved on the shore (0.3mm). Sediment samples and beach slope estimations were also obtained. Natural and man-made debris were brought to the laboratory, where floating particles were recovered. Plastics were sorted (Pellets, Fragments, Film, Foam), weighed measured and classified as micro (< 5mm), meso (< 20mm), macro (< 100mm) and mega debris (>100mm). Debris types were analyzed using gas chromatography and mass spectrometry, determining plastic composition, and POPs profiles and concentrations. As a first step for future research, this diagnosis aims to generate scientific knowledge that improves plastic waste management in these beaches and their watersheds.

TP017. Plastic pollution: a problem with no borders

J. Frias, P. Sobral, MARE FCT-UNL / IDCEA

Although there are documented evidences of the presence of marine litter in the environment since the 1970’s, it was only after the discovery of an extensive patch of accumulated debris in the North Pacific Central Gyre, that this subject raised international awareness. After this, worldwide concern about the impacts of marine litter have risen, breaking way to new scientific research and decision-making approaches to address this global problem. Plastic accumulation in marine ecosystems and consequent degradation and fragmentation into particles usually known as microplastics, some of microscopic sizes, usually known as microplastics, constitute a direct threat to filter feeders and other marine organisms who mistake these particles for food. Another startling characteristic of plastic materials is its capacity to adsorb persistent and bioaccumulative toxic chemicals that have great impacts on wildlife. There is still a lack of information regarding the ingestion effects of microplastic particles in marine organisms, but there are studies that show the potential bioaccumulation threat through the food chain. This presentation will share data of bioassays using environmental relevant concentrations of microplastic particles and marine mussels. Data which can be integrated within the scope of the Marine Strategy Framework Directive, thus contributing to the understanding of hazards inherent to this emergent environmental threat.

TP018. Waste water treatment plants (WWTP) as a source of microplastics in the aquatic environment

F. Murphy, University of the West of Scotland / School of Science; C. Ewins, University of the West of Scotland / Institute of Biomedical and Environmental Health Research; B. Quinn, University of the West of Scotland

Municipal effluent discharged from waste water treatment plants (WWTP) may be a significant contributor of microplastics to the environment as many face wash products can contain plastic microbeads; also the simple act of washing clothes contributes in releasing the thousands of fibres into the waste water. The ability of WWTP to remove these microplastics is therefore important in preventing its release into the environment. A secondary WWTP located on the River Clyde, Glasgow serving 650,000 people was sampled at different stages of the treatment process; before fine screening, after grit & grease removal, after primary treatment, and the final effluent, before it is released to the River Clyde. 10L steel buckets were lowered into the effluent to collect the samples, this was then passed through a plankton net (45µm) and/or a steel sieve (65µm) to collect any debris present. This debris was then washed into glass...
bottles, and vacuum filtered. Any potential microplastics present were then identified using Fourier Transform Infrared Spectrometry (FT-IR). Using flow rate data collected by the WWTP, the amount of microplastic potentially being released was calculated. Grit, grease, and sludge samples were also collected and examined for microplastics, in order to determine where the extracted microplastics were accumulating. Throughout sampling and laboratory work strict contamination controls were put in place to prevent contamination from atmospheric microplastics, this included the use of forensic science techniques. Preliminary results show that although the majority of the microplastics entering the WWTP are being removed, microplastics are still released from this treatment plant within the final effluent. The average amount of microplastics released per litre was calculated at 0.23. The average daily amount of effluent released is 260,954 m³. Therefore over 60 million microplastics could be released into the River Clyde every day. These microplastics include polyester, polamide, and acrylic amongst others consisting mainly of fibres and flakes. This work shows that even a modest amount of microplastics being released per litre of effluent could result in significant amounts of microplastics entering the environment due to the massive volumes of water being treated. Continued research on this subject may provide valuable insights into the role WWTP play in microplastics entering the environment.

**TP019. Marine debris causing a rise in climate change & cancer diagnoses through the releasing phthalates**

**D. Gilliam, Lyrical Clause**

Overall acidification of the marine plastics through photonic exposure has been a contributor to the rise CO2 emissions. This is a Photochemical process that also releases Phthalates into our natural resources while changing the chemical balance of the ocean and its rate of diffusion. Phthalates can become airborne if brought in with the tide from plastic debris that have been exposed to UV radiation and could be dangerous as they could enter people’s respiratory systems then create cancer cells. Once apart of the mass production process to give plastics their translucency and flexibility recent studies show how it can increase Birth Defects and Breast Cancer risk with enough exposure.

**Biomarkers in Terrestrial Ecotoxicology: Stress Ecology in Bees**

**TP020. Effect of continuous exposure to the fungicide picoxystrobin in newly emerged workers of Africanized Apis mellifera: analysis of multiple endpoints**

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Bees are responsible for pollinization of many crops and contribute to the maintenance of ecosystems. Thus, bees can be exposed to several environmental stressors, including pesticides, what is causing the decline in their populations. Our objective was to evaluate Africanized Apis mellifica workers submitted to continuous exposure to picoxystrobin for five days by means of multiple endpoints: mortality rate, number of hemocytes per bee, morphological alteration and immunolabeling of superoxide-dismutase enzyme (SOD) in the fat body. For this purpose, operculated brood combs collected from three colonies were transferred to incubator (34°C, RH 70%) for monitoring the emergence. The one day-old bees were transferred for bioassay cages (n=20 bees/cage). Each experimental group were assayed in triplicate: I) Control; II) Exposed to picoxystrobin (18ppb) in a sugar solution. The oral exposure was ad libitum. The analysis of the micrographs showed some alterations on the midgut and Malpighian tubules cells due the exposure to contaminated pollen and nectar. So, this insecticide can reach organs involved in metabolism of food. Based on this, the present study aimed to analyze the effects of thiamethoxam in the midgut and Malpighian tubules of Africanized Apis mellifica. For this, newly emerged workers were exposed for 8 days to a diet containing a subletal dose of thiamethoxam equal to 1/100 of LC50 (0.0428 ng a.l./L of diet). The bees were dissected and the organs were processed for Transmission Electron Microscopy. The analysis of the micrographs showed some alterations on the midgut and Malpighian tubules cells due the exposure to the insecticide. Midgut cells showed alterations as the presence of vacuoles in the cytoplasm, intercellular spaces dilated, increase of rough endoplasmic reticulum and mitochondria exhibiting decreased mitochondrial cristae and loss of matrix. In Malpighian tubules, the ultrastructural analysis showed clear disruption of the basal labyrinth, and the presence of significantly altered mitochondria. This study induced us what very low concentrations of the insecticide thiamethoxam cause damages to the organs involved in absorption, metabolism and excretion. Therefore, such effects may result in physiological changes and consequently impair the survival of these individuals. The results contribute to a better understanding of the toxic action of thiamethoxam to the bees, providing arguments for the sustainable use of pesticides and the preservation of these pollinators. Acknowledgement: FAPESP - Contracts grant numbers: 2014/14070-3, 2012/13370-8, 2012/50197-2.

**Detection of Endocrine Disruptors and Other Micropolutants Through Effects on Aquatic Organisms**

**TP022. Development of bivalve biomarkers - cracking the code of mollusc endocrinology**

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Since the discovery of endocrine disrupting chemicals (EDCs) research has focused on vertebrates both when it comes to effects in the environment, development of biomarkers, test guidelines etc. However, effects on invertebrates in the environment have also been reported; intersex has been observed in some bivalve species and increased yolk protein levels, estimated indirectly by the non-specific alkalai-labile phosphate method (ALP), have been reported. Both biological responses are recognized estrogenic biomarkers in fish but the ALP-method has been replaced by specific and direct enzyme-linked immunooassays (ELISA). Unfortunately, the methodology for molluscs has not been correspondingly refined and as the reproductive strategies of bivalves are very perinuclear cytoplasm of trophocytes from bees exposed to fungicide. We infer that the decrease in intensity of positive labelling for SOD at the trophocytes from bees of the fungicide-exposed group might be related to changes in the nucleus morphology, which might reflect the increased SOD expression in trophocytes as a compensatory response to the decrease in SOD expression in the oenocytes that were observed in the fungicide-exposed group. Although the picoxystrobin induced mortality and no interference in the amount of immune cells, the results showed changes of the fat body at the cellular level, showing the importance of evaluating multiple endpoints in ecotoxicological studies with bees.
diverse interpretation of experimental data is often troublesome. As bivalves are important for aquatic environments it is of great importance to investigate the effects of anthropogenic contaminants on bivalves. However, validated sensitive methods and basic knowledge about bivalve reproduction is essential for proper evaluation of field data and for the development of endpoints for future test guidelines. Recent research has indicated that we might have to re-think our understanding of mollusc reproduction and endocrinology instead of seeing it through our pre-understanding of vertebrate endocrinology. Steroid receptors (SR) have been identified in molluscs but in contrast to vertebrate SRs they display constitutive activity and the activation is independent of ligand binding. This supports our recent experimental data on a freshwater bivalve; male and female yolk protein levels differed when determined by ELISA, which is not always seen by the ALP method, and estradiol was unable to induce intersex and yolk protein production. The lack of ligand activated SRs in molluscs indicates that regulation of reproduction differs from vertebrates and suggests that alternative regulatory mechanisms exist. To obtain basic knowledge on bivalve reproduction and to aid in the development of reliable bivalve biomarkers for environmental and guideline purposes we have developed species-specific immunoassays (ELISA) for yolk protein of freshwater and marine bivalves. We used the assays to study the annual reproductive cycle and to investigate the possible association between intersex and yolk protein induction upon exposure to known vertebrate EDCs and potential disruptors of invertebrate reproduction.

TP023. Efecto genotóxico de etinilestradiol en Aequidens metae (Pisces: Cichlidae)

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Los perturbadores endocrinos (PE) son agentes exógenos presentes en los cuerpos de agua capaces de interferir en el sistema endocrino reproductivo de los peces causando una gran variedad de trastornos en el desarrollo y la reproducción. Existen sustancias que tienen el potencial de actuar como perturbaadores endocrinos alterando la fisiología de los organismos a través de antagonismos o agonismos de los andrógenos y estrógenos. Etilenestradiol (EE2), es una hormona sintética que hace parte de la composición de medicamentos anticonceptivos. EE2 es un reconocido contaminante del agua que produce perturbación endocrina en los organismos expuestos, generando alteraciones reproductivas. Los peces han sido utilizados comocentinelas de contaminación en cuerpos de agua naturales, se ha documentado el efecto de EE2 sobre hígado, gónadas, plasma, vitelogenina entre otros. A pesar del gran interés que los PE han generado, en Colombia se han realizado escasos estudios por tanto, el objetivo del presente estudio fue evaluar el efecto genotóxico de etinilestradiol EE2 en adultos de Aequidens metae bajo condiciones de laboratorio. El presente trabajo se realizó en el laboratorio de toxicología en el Instituto de Acuicultura de la Universidad de los Llanos, localizado a 12 Km de la ciudad de Villavicencio, Colombia. Se utilizó el método de hemólisis de eritrocitos de Aequidens metae; los peces fueron obtenidos de la estación piscícola de la Universidad de los Llanos, fueron seleccionados peces con 9±5 cm de longitud y peso de 10±2 g, aclimatados durante un periodo de veinte días y distribuidos aleatoriamente en 36 acuarios de vidrio con capacidad de 2L, a una densidad de 6 peces por acuario con recambio de agua del 20% cada tercer día. Los peces fueron expuestos a cuatro concentraciones de EE2 0,5; 5,0; 50 y 250 ng/litro de agua y etanol como control positivo durante 21 horas. El efecto genotóxico fue establecido mediante la determinación de la frecuencia de micronúcleos en eritrocitos de sangre periférica. Se evidenció un claro efecto monotónico en eritrocitos de los peces expuestos a las mayores concentraciones de EE2, siendo 50 y 250ng/L las que indujeron las mayores frecuencias de micronúcleos. EE2 causa genotoxicidad en Aequidens metae a concentraciones de 50 y 250ng/L.

TP024. Effects Of Estradiol and/or Ethinylestradiol on Sperm Quality, Fertilization, Embryo and Larval Survival of Pejerrey Fish (Odontesthes bonariensis)

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17β-Estradiol (E2) and synthetic 17α-Ethinylestradiol (EE2) are estrogenic compounds present in surface waters as the consequence of municipal sewage discharges. The aim of this study was to evaluate the effects of E2, EE2 and its mixtures on different reproductive parameters and embryo-larval survival in pejerrey fish (Odontesthes bonariensis). In order to analyze the effect of these compounds on sperm quality, fertilization %, embryo and larval survival (%), and the point of no return (PNR), different assays were performed using concentrations 175, 350, 700 and 1400ng/L of E2; 22.5, 45, 90 and 180 ng/L of EE2; and mixtures M1 (175 E2 + 22.5 EE2 ng/L), M2 (350 E2 + 45 EE2 ng/L), M3 (700 E2 + 90 EE2 ng/L) and M4 (1400 E2 + 180 EE2 ng/L). No significant differences in sperm motility parameters were observed between E2 and EE2 treatments with the control group. However, significant decreases in motility % were recorded for all the mixtures tested compared with control samples. For fertilization %, only the sperm activated with M4 showed a significant decrease compared with the control group. In the case of embryo survival there was only a significant decrease in the highest concentration of EE2 compare with the control group. For the mixtures, M3 is the one that had the most adverse effect on embryo survival. In larval survival, there was a significant decrease in concentration 175 and 700 ng/L of E2 compare with the control group. In EE2 treatments, the ones with a significant reduction in the larval survival were concentration 45 and 90ng/L. And for the mixture treatments, M1, M3 and M4 had a significantly lower larval survival than the control group. The PNR was only significantly different in M1 compared with the control group. The results obtained demonstrated that the exposure to mixtures of E2 and EE2 affected fish sperm motility, fertilization % and, embryo and larval survival, even at relevant environmental concentrations, and highlight the need to consider the effects of pollutants mixtures in ecotoxicological studies.

TP025. Estrogenic activity in sediments from the santa lucía river basin (Uruguay)

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Xeno-estrogens are Endocrine disrupting chemicals (EDCs) that can bind to estrogen receptors and trigger endocrine responses, including feminization. We investigated estrogenicity in sediments of the Santa Lucía River Basin, which supplies drink water to near 70% of the people living in Uruguay. Along the basin there are different land uses and urban areas that lead to the potential presence of a wide range of toxic substances. Using in vitro yeast estrogenicity screen bioassy (YES) we analysed 42 sample sites covering the entire watershed. Estrogenic activity were observed in 13 sites, most of them associated with areas of high urbanization, and few points associated with agriculture. An analysis of principal components was performed in order to study the distribution of sites by land use classification: the group comprised of sites with high rates of urbanization presented a 75% of sites with estrogenic activity. Generalized Linear Model (GLM) were performed in order to explore the association of land use with estrogenicity. Sites with higher estrogenicity (EQ-E2 ng/g of sediment) were associated with urban areas followed by agriculture and cattle (1290.84 ± 32.46; 41.68 ± 2.25 and 32.46 ± 7.38 respectively). These results highlights the urgent need to take into account the presence and activity of EDCs in environmental management of drink water sources of Uruguay.

TP026. Molecule degradation and adsorptive capacity analysis of 17β-estradiol and 17α-ethinyl estradiol in formulated sediment by GC-MS

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Formulated sediments have been widely adopted and recommended by environmental protection organizations and international agencies such as U.S. EPA, OECD, and ASTM. This study aims to evaluate the behavior of formulated sediment representative of Brazilian lotic environments spiked with endocrine disruptors 17β-estradiol (E2) and 17α-ethinyl estradiol (EE2). Formulated sediments were created based on coarse, medium, and fine calcined sand, sterilized kaolin clay, and fish food TetraMin® as organic matter, and spiked with a 500 ng/L solution of each contaminant separately to determine the period of degradation of each endocrine disruptor. The vessels were shaken at 175 rpm during the periods: 2h, 24h, and 48h. After 30 minutes rest, the liquid portion was extracted by centrifugation at 2,000 rpm for 10 minutes. To determine the contaminants’ adsorption capacity in formulated sediment, vessels were likely shaken for 2 hours and 60 minutes rest, and 180 mL of superficial solution were collected and sent to filtration process, while sediment was centrifuged to extract about 200 mL of liquid portion. Glass fiber microfilters (Macherey-Nagel®, GF-
1) were used to filter every solution, to which HCl was added to reach pH 3. Contaminants were concentrated on C18 cartridges (Agilent®) on solid phase extraction (SPE) step, and eluted with ethyl acetate. Derivatization was carried out using the reagent MSTFA activated III and samples were analyzed by GC-MS. Results showed that after a period of agitation of 2, 24, and 48 hours, E2 concentration decreased 6.6, 78.5, and 94%, respectively, compared to the initial concentration of E2, sub product of E1, up appeared. The same period of agitation resulted in decrease of EE2 (45.5, 71.5, and 61%), possibly due to sediment adsorption. In the study of retention capacity, concentrations of both contaminants E2 and EE2 were slightly lower in the pore water than in surface water, perhaps because of the short rest period (1 hour), which may not be sufficient for the molecules to settle within the vessel. Thus, it is estimated that test organisms exposed to spiked sediments are in contact with lower concentration compared to the theoretical concentration of the test solution, and also they may be exposed to E1 after 24 hours in contact to sediment spiked with E2.

TP027. The expression of selected thyroid and corticosterone linked genes in panpeastitis suffering obese Mozambique tilapia, Oreochromis mossambicus

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Various anthropogenic compounds have been shown to disrupt endocrine signalling in fish, of which thyroid disruptors are a major sub-class. The thyroid system plays and integral part in metabolic homeostasis and thyroid disruptors may therefore promote metabolic disorders. The Mozambique tilapia (Oreochromis mossambicus) is a representative species of the genus Oreochromis, which suffers from obesity and panpeastitis. Lake Loskop is located downstream of the heavily polluted upper Olifants River catchment, and the local fauna are therefore potentially exposed to a diversity of pollutants which may include endocrine disruptors. In this study, we evaluated the expression of selected genes involved with thyroid and corticosteroid signalling as well as peroxisome proliferator-activated receptor gamma (pparg) in brain tissue of adult O. mossambicus collected from Lake Loskop as well as an alternative population. Moreover, the expression of a selection of thyroid-linked genes and pparg were evaluated in juvenile O. mossambicus exposed to Lake Loskop surface water in vivo as a short term screen for biological activity. Our data suggest altered thyroid signalling in Lake Loskop fish relative to the alternative population, yet no link between panpeastitis incidence and altered endocrine signalling. In addition, the expression of the type 2 deiodinase (involved with thyroid hormone transformation/synthesis) and pparg were upregulated in juvenile fish exposed to lake water containing algae and other micro-organisms. These changes in gene expression may be related to either the effect of fasting, or chemical exposure via algae, seeing that certain substances including toxic metals are known to bioaccumulate in these micro-organisms. No link could be identified between the incidence of obesity and panpeastitis and thyroid and corticosteroid signalling.

TP028. Induction of carboxylesterase activity in Chilina gibbosa after a short term exposure to river water polluted by a natural petroleum spill

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Las Minas stream is located southeast of the city of San Carlos de Bariloche in the south of Argentina (41°17′21″ S, 71°10′58″ O, 1001 msnm). Between 1910 and 1940 natural reserves of crude oil near to the stream were exploited commercially until the activity stopped and the source was abandoned leaving behind an oil spill that affects Las Minas and also downstream water bodies. Chilina gibbosa is a freshwater gastropod native to most streams and lakes of southern Argentina and Chile and could be one of several non-target species affected by exposure to polycyclic aromatic hydrocarbons (PAH) present in Las Minas. The aim of this study was to evaluate the effects of sample water from Las Minas stream and petroleum (PE) sub product of E1, up appeared. The sample water were carried out exposing snails to clean river water (Control, C), river water from a contaminated site in Las Minas (River Water, RW) and to a 1% dilution of the water soluble fraction of the petroleum found in the contaminated site in Las Minas (Water Soluble Fraction, WSF) for 48 hours. CEs activity was measured using p-nitrophenyl acetate (p-NFA) and p-nitrophenyl butyrate (p-NFB) as substrates. At the end of the exposure period, a noticeable difference in pigmentation was observed. Snails exposed to petroleum (RW and WSF) presented a darker foot area than control animals. Animals exposed to river water from Las Minas (RW) showed an activation effect of 65% with respect to control animals in CEs activity measured with p-NFB (p<0.05). CEs activity measured with p-NFB of animals exposed to the 1% dilution (WSF) did not differ significantly from CEs activities of control nor RW snails. No differences were found between CEs activity of the water from the vessel, and exposed animals when p-NFA was used as substrate. As a first approach to the subject, this study shows that C. gibbosa is affected by petroleum that might be present in its natural habitat as is the case in Las Minas stream and that CEs activity could be a useful biomarker of PAH.

Environmental legacy of the antifouling paints biocides in South America

TP029. Evidence for a role of retinoid X-receptor and its endogenous and exogenous agonists in phallic development (imposex) of Pomacea canaliculata

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Imposex (= the superimposition of male sexual characters onto females) has been studied in nearly 300 species pertaining to the Vetigastropoda, Neogastropoda and Littoninomorpha (all of them clades of the highly diverse class Gastropoda). However, the Ampullariidae are unique among gastropods in that females show a primordial presence of the copulatory organs, analogous to the phallic tubercle or clitoris found in other female animals (including vertebrates). This primordial phallic (o copulatory) apparatus grows with age (after sexual maturity) in Pomacea canaliculata (Ampullariidae), but also when it is exposed to tributyltin (TBT) (=imposex). On their part, penises and/or vasa deferentia of non-ampullariid females develop as neoformalizations in unpredictable places on the right side of the neck. The existence of the well-delimited phallic primordium in P. canaliculata allowed us to study the role of retinoid X receptor (RXR) agonists in the development of imposex. We determined: (1) the effect on phallic growth of 9-cis-retinoic acid (9cis-RA), the reported endogenous agonist of RXR, and of TBT, TPT (tributyltin), reported RXR agonists; and (2) the expression of RXR in the phallic apparatus of control, TBT, TPT and 9cis-RA treated females. In the first experiment, 4-month old females received (i.m.) 1 and 2 µg of TBT, TPT or 9cis-RA per g of drained body mass, or the corresponding vehicle (2 µL). The snails were sacrificed 2 and 4 weeks later and the length of the penial sheath (PsL) and the penis (PL) was measured. Also, an “index of phallic development” was calculated (IPD, similar to the popularly used VSDL, “vas deferens sequence index”, but adapted to ampullariid anatomy). All studied RXR agonists were effective in increasing PsL, PL and IPD. In the second experiment, the expression of the RXR in the phallic primordium (Western blot) was studied in control, TBT, TPT and 9cis-RA treated females, which showed an increased expression of RXR in response to the agonists, specially with 9cis-RA treatment. It is concluded that endogenous RXR agonists may control phallic development in female P. canaliculata. A possibly similar role should be explored in development of the corresponding primordium in juvenile males and females.

TP030. Imposex incidence in gastropod species from coastal areas around Cape Town, South Africa, after the TBT world ban

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Tributyltin (TBT) is a synthetic compound released into the environment mainly through antifouling paints used as protective coatings on ships. A Convention banning TBT-based antifouling paints was adopted in 2008 by the International Maritime Organization (IMO). However, recent studies, mainly in developed countries, reported environmental TBT levels at sufficient concentrations to induce biological effects. One of the most well known effects of TBT contamination is imposex. This is defined as the superimposition of male sexual characters, such as a penis and a vas deferens, onto female gastropods. Imposex is a powerful and specific biomarker, used worldwide to map tributyltin contamination in coastal environments. Information for Africa is scarce and no
imposex studies have been published for Sub-Saharan Africa after the global TBT ban. High levels of TBT have recently been detected in environmental samples collected around Cape Town Harbour, South Africa. Therefore, this preliminary study aimed to evaluate the imposex incidence in gastropod species from Cape Town. Adult specimens of Burnupena cincta or Nucella cingulata were collected at seven sampling sites, two of these at Granger Bay Marina (300 m from the port of Cape Town), and five others in Cape Town's coastal areas. Three sites served as control (Kogel Bay, Strand and Millers Point). Animals were narcotized with a 3.5% MgCl2 solution, shell lengths (mm) were measured and shells were removed. Gender identification was based on the presence or absence of sexual accessory glands (albumen, capsule, seminal receptacle). Penis length and the presence of a vas deferens in females and males were recorded. The following imposex indices were used: % imposex in females (I%), Relative Penis Length Index (RPLI) and Vas Deferens Sequence Index (VDSI). High imposex incidence (% = 100, RPLI = 86.3 and VDSI = 3.8) was found in N. cingulata at Granger Bay Marina. Imposex was also found in B. cincta from Cape Town. The International Maritime Organization (IMO), in 2008, implemented a resolution banning tributyltin (TBT) paints based on organotin compounds continue to be used on boats that travel near the São Luís Island. Some of these at Granger Bay Marina (500 m from the port of Cape Town), one at Kalk Bay Harbour and a third site at Gordon’s Bay Marina. Adult specimens of Burnupena cincta or Nucella cingulata were collected from São Paulo harbor areas 7 years after the international ban and that, as a result, reproduction of local gastropods is being compromised. Additional studies are needed to determine environmental TBT levels throughout the region, as well as the extent of imposex prevalence in gastropods.

TP031. Occurrence assessment of imposex in gastropod molluscs from São Luís Island, Maranhão, Brazil

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In Organotin compounds, especially tributyltin and Triphenyltin, have high toxicity for different animal species, because they act as endocrine disruptors even at extremely low concentrations. Despite the deleterious effects and the prohibition of the use of these compounds by the International Maritime Organization, these are still widely used as active ingredients in antifouling paint formulations, which are applied to the hulls of boats in order to prevent biofouling. This study aimed to monitor the occurrence of Imposex - highly specific hormonal disorder that affects females of several species of molluscs, such as Stramonita haemastoma, giving them non-functional masculine characteristics such as penises and vas deferens to detriment of the typical females characteristics, which can in the long term, cause extinction of the local species. Sampling of animals was held at the end of the dry and wet seasons in seven coastal regions of São Luís Island, Maranhão, some of them characterized by large and small craft movement and other areas where there is an absence of this type of movement. In each of the seven points were collected thirty bodies, which were packed in airtight bags and taken to the lab at the end of the points in solution at 3.5% MgCl2 two hours before being analyzed. After this period the animals were submitted to morphological analysis. The shell of each was measured and then removed for sexual evaluation of these was performed. The animals with both penises and seminal receptacles were considered females in some Imposex exposed group and indicated as controls (CT) whereas in females sampled points, with percentages ranging from 26 to 92%, with the highest rates obtained in the dry season. In a comparison made with results obtained for the same collection points in previous sampling dates, there was an increase in the percentage of affected animals. It was also noted a decrease in the proportion of females in the sample and very difficult observation of female characters, such as the seminal receptacle. These observations strongly suggest that antifouling paints based on organotin compounds continue to be used on boats that travel near the São Luís Island.

TP032. Temporal trends of imposex incidence in Stramonita haemastoma from São Paulo harbor areas

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The International Maritime Organization (IMO), in 2008, implemented a resolution banning tributyltin-based antifouling paints. However, recent studies, mainly in developed countries, have reported environmental occurrences of tributyltin (TBT) at sufficient levels to induce biological effects. One of the most well-known adverse effects of TBT contamination is the imposex phenotype, which is a superimposition of male sexual characters onto female gastropods. Imposex is a powerful biomarker used worldwide to map TBT contamination in coastal environments. In Brazil, there are only few studies on temporal trends of imposex incidence, even regarding the busiest harbor areas in the country. Therefore, the present study assessed the imposex incidence (imposex %, RPLI, RPLI and VDSI) in 16 populations of Stramonita haemastoma during 3 sampling campaigns performed in 2011, 2012 and 2014 in areas influenced by Santos and São Sebastião harbors. Based on the correlation observed between shell length (SL) and penis length (PL), the imposex parameters (PFLIstand and RPLIstand) were standardized by SL to avoid bias. The obtained RPLIstand, VDSI and RPLIstand for both studied areas showed, as a general pattern, higher imposex levels in areas under the influence of São Sebastião harbor. This finding was statistically corroborated, predominantly, by PFLIstand values (p < 0.001). Similarly, imposex %, RPLIstand and VDSI were lower in Santos region during the 2011 and 2012 surveys. These results suggested that São Sebastião is a more vulnerable area to TBT contamination, despite Santos harbor having a heavier ship traffic. Temporally, a decrease in VDSI was detected in 3 sites from Santos and in 7 sites from São Sebastião, while the remaining sites presented a VDSI increase. These deviations can be related to the differences among distances and inputs from potential TBT sources. Considering these two localities, the RPLI values indicated imposex reduction in 14 of the 16 studied sites. In fact, several studies have reported the RPLI as a more reliable index to be used in the monitoring of imposex temporal trends, since it naturally balances variations within the sample. Thus, the results suggest a temporal reduction of the TBT impact in these areas during the analyzed period. However, determination of levels of TBT and its degradation products should be performed in these samples to confirm such amelioration.

Use of Pesticides and Their Impacts on Native Species: The Situation in Latin America.

TP033. Adverse effects promoted by a commercial formulation of the insecticide Fipronil in liver biomarkers of sábalo (Prochilodus lineatus)

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Current Use Pesticides (CUPs) are emerging pollutants of special concern because their increasing input into the aquatic environments. Fipronil is a CUPs whose toxicity in insects is well documented, although limited knowledge concerning sublethal effects is available in other non-target organisms (eg, fishes). In this context, the biomarker responses promoted in juveniles of P. lineatus were evaluated after 48 h of exposure to a sublethal concentration of a commercial formulation of fipronil (Fp) dissolved in water (nominal value of 100 μg/L). The reversibility of these responses was also studied in exposed individuals after 15 days of permanence in tapwater under laboratory conditions (RFp). A Control series of unexposed individuals were simultaneously tested during exposure (Ctrl) and recovery (RCtrl) phases. Water samples were taken in order to measure levels of toxic. After the experimental period, fish were weighed, anesthetized and the liver were extracted. Condition factor (CF) and liver somatic index (LSI) were calculated, glutathione-S-transferase activity (GST) as well as the levels of lipid peroxidation by TBARS and antioxidant capacity against peroxyl (ACAP) were determined. CYP1A protein expression in liver was also estimated by means Western blotting. Differences between groups were analyzed using one way ANOVA and Tukey's multiple comparisons. No significant differences among groups were detected in CF, LSI or GST. Fish exposure to Fp promoted an increase of 61% in TBARS levels but also in ACAP values (65%) showing a decrease in the antioxidant capacity respect to Ctrl group. Fipronil exposure also enhanced the response of CYP1A and reactive bands were observed in Fp group. Transference of exposed individuals to control media (RFp) promoted a non significant decrease in TBARS values respect RCtrl group, however ACAP values differentiated between these two groups. These results indicated that a short term exposure of formulated fipronil promoted in liver of this native species adverse effects showing that biotransformation processes were mediated by CYP1A and that oxidative damage was generated on lipids. Assayed recovery phase would also confirm the availability of reversing the adverse effects promoted by Fipronil.

TP034. Antioxidant enzyme activity and oxidative stress in Pomacea canaliculata (Mollusca: Gastropoda) exposed to cypermethrin.

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Several agrochemicals extensively used to control pests in agricultural practices could affect non-target fauna. Most pesticides are lipophilic and passively absorbed through lipid membranes. The effect of these compounds in organisms depends on their susceptibility to biotransformation. In certain organisms, pesticides could alter reactions in aerobic oxidative metabolic pathways causing oxidative stress, condition that leads to protein degradation and enzyme inactivation, lipid peroxidation, damage of nucleic acids and finally cell death. In Argentina, the pyrethroid cypermethrin (CYP) is widely used in agricultural activities. In order to determine metabolic disorders that could be used as biomarkers of pollution, the native freshwater snail Pomacea canaliculata was selected for the present study. Adult males and females of snails were exposed to sublethal CYP concentrations (10, 25 and 100 µg/L), for 1, 7 and 14 days and a biodepuration assay was also performed. The activities of the enzymes superoxide dismutase (SOD), catalase (CAT) and glutathione-S-transferase (GST) and the levels of lipid peroxidation (LPO) and protein oxidation (PO) in digestive gland and gills were assessed. In digestive gland, CYP caused a significant increase in the antioxidant enzymes SOD, CAT and GST activity compared to the control group (p<0.05). Also, LPO and PO levels were affected by CYP treatment (p<0.05). Biodepuration treatment showed significant differences (p<0.05) in some biomarkers respect to controls, mainly LPO levels in digestive gland. In most cases, gills did not show significant differences in the biomarkers analyzed in exposed snails to CYP compared to controls. In general, only few treatments showed significant differences (p<0.05) between males and females of P. canaliculata. Complementary histological studies in snail exposed to CYP were carried out showing histopathological damage in these same tissues. The results of this study indicate that oxidative stress status in P. canaliculata, especially in digestive gland, are significantly affected by CYP probably due to this organ has been characterized as the main site for toxicant metabolism in molluscs. Therefore, these biomarkers could be proposed to monitor pyrethroid pollution in freshwater environments.

TP035. Aquatic toxicity of the pesticides Kraft 36EC® (a.i. abamectin) and Score 250EC® (a.i. difenconazole) and their active ingredients

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The increase in world population and the growing demand for food have motivated the use of large amounts of pesticides, causing direct or indirect contamination of aquatic ecosystems. The insecticide Kraft (a.i. abamectin) and the fungicide Score (a.i. difenconazole), are used on various crops, including strawberry crop. For active ingredients, acetone was used as solvent. The chronic 96h ecotoxicological tests were conducted with the algae Pseudokirchneriella subcapitata. For tests with the algae, University / Hydraulics and Sanitation

TP036. Avaliação dos efeitos do inseticida Imidaclopidr sobre parâmetros hematológicos e bioquímicos no peixe Prochilodus lineatus

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The insecticide neonicotinoid imidacloprid destaca-se entre os dez ingredientes ativos mais comercializados no Brasil e mais extensivamente utilizados na região norte do Paraná devido a sua eficiência no controle de insetos sugadores. Sendo assim, faz-se necessário avaliar a toxicidade deste composto principalmente para espécies de peixes nativas. Com este trabalho objetivou-se avaliar os possíveis efeitos do produto formulado Imidacloprid (48% imidacloprid) sobre parâmetros hematológicos e bioquímicos do peixe neotropical Prochilodus lineatus. Para tanto, animais juvenis (14,1 ± 1,14 e 10,77 ± 0,67, média ± EP) foram expostos em aquários (n=8 por grupo) contendo somente água desolorida (CTR) ou 5, 10 e 20 mg/L-1 de Imidacloprid® (IMI 5, IMI 10, IMI 20 respectivamente), durante 24 h. Após a exposição os peixes foram amostrados para coleta de sangue, utilizado para a dosagem do conteúdo de hemoglobina (Hb), hematócrito (Ht) e número de células vermelhas (RBC), e de fígado, para a determinação do conteúdo de glutationa reduzida (GSH), lipoperoxidação (LPO), atividade da glutatiana-S-transferase (GST) e catalase (CAT), e cérbero e músculo para determinação da atividade da acetilcolinesterase (AChE). Os peixes do grupo IMI10 (62,05 ± 6,17) e IMI20 (64,18 ± 6,51) apresentaram uma menor atividade (p=0,003) da GST (em nmol CDN2 conjugado/ min/mg proteína) com relação ao CTR (102,2 ± 12,5). Com relação aos parâmetros hematológicos, foi encontrado um maior número de células vermelhas (em número de eritrócitos/mm3 de sangue) no grupo IMI 20 (2,36 ± 0,20 com relação a um resultado de 1,91 ± 0,31 para os controles) (p=0,023). Os demais parâmetros analisados não apresentaram diferença significativa entre os diferentes grupos. Estes resultados mostram que o produto formulado nas concentrações testadas e no curto tempo de exposição mostrou-se pouco tóxico para a espécie estudada, visto que danos oxidativos e neurotóxicos não foram encontrados, embora o composto tenha interferido na via de biotransformação de fase II.

TP037. Azínhoes methyl-induced changes in Jennyssia multidentata gills

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The intensive fruit production in Rio Negro valley leads to the massive use of organophosphorus (OP) pesticides. The purpose of this study was to determine the toxic effects of the OP azinphosphates (AZM) in Jennyssia multidentata gills. Static sublethal exposures to 5 and 10 µg/L AZM of adult female J. multidentata were made during 96 hours. Histopathological alterations were evaluated through hematoxylin-eosin staining and optical microscopic. Reactive oxygen species (ROS) were determined by fluorometric imaging (ex/em: 485/520 nm) using 2′,7′-dichlorofluorescein diacetate (H2DCF-DA) and quantifying digital images with ImageJ 1.49p program version. Significant differences (p = 0.0235, nonparametric Kruskal-Wallis test) were assessed for ROS production in gills as a result of AZM exposure. Post hoc test indicated that ROS measured in gills of the animals exposed to 10 µg/L AZM were significantly higher than those from control ones (p < 0.046). Regarding to histopathological changes in the respiratory lamellae, we found intraepithelial edema, hemorrhages, enlarged blood spaces and fusion of some lamellae. In the primary lamellae, cell proliferation and hyperplasia were found. These results demonstrate the high susceptibility of J. multidentata to one of the agrochemicals actually used in the region, AZM, leading to deleterious effects even at exposures to sublethal concentrations.

TP038. Bioaccumulation of endosulfan on a cichlid fish: differences between exposure to the active ingredient or a commercial formulation

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The organochlorine pesticide endosulfan (ES) has been restricted or banned worldwide after its inclusion in the list of Persistent Organic Pollutants by the Stockholm Convention. In Argentina, it has been intensively used as a wide range insecticide in crops of high commercial value like soy. Consequently, this pesticide is currently one of the most frequently detected contaminants in the aquatic environment. The pesticide mixture contains two isomers, a- and b-ES,
which can be converted to ES-sulfate (ES-S) by biotic or abiotic oxidation. All 3 compounds exhibit high acute toxicity to aquatic organisms, acting as reproductive disruptors in fish. Toxicological studies focus almost exclusively on the active ingredients (AIs) of pesticides. However, AIs and commercial formulations (CFs) can differ in toxicity, due to additive or synergistic effects of non-specific "inert" ingredients -adjuvants and additives used to increase solubility, dispersion, and uptake of the pesticide. The aim of this study was to evaluate the difference in bioaccumulation of waterborne ES after acute exposure to the AI or a CF, in adult male C. dimerus. Fish were exposed to 0.7 mg L-1 ES AI (94.99% purity) or a CF (Zebra Ciagro® 35% ES) for 2 weeks under semi-static conditions. After exposure, liver, gonad, gill, brain and muscle samples were collected. Endosulfan a-, b- and ES-S were quantified by gas chromatography-electron capture detector. Differences in bioaccumulated ES between organs (ag = 1 wet wt) were tested using a Friedman ANOVA analysis for multiple dependent samples. Spearman correlation coefficient was performed between lipid % and bioaccumulation levels. On fish exposed to ES, high levels of ES-S were detected in most organs, save for muscle. Levels of this metabolite were highest in liver and brain of fish exposed to the CF. Regarding aES, significant levels were detected in gills and brain of fish exposed to the AI, whereas in males exposed to the CF levels were minimal. Lipid content was highest for liver, followed by tests, brain, gills and muscle. There was a positive correlation between lipid % and ES-S levels in fish exposed to the AI and CF. Obtained results suggest a rapid metabolization of ES isomers to ES-S in fish tissues. Isomers were present in highest amounts in gills, the organ in direct contact to waterborne ES, suggesting recent uptake. The presence of coadypsants appears to increase bioaccumulation of ES-S, particularly in liver and brain.

TP039. Biochemical biomarkers in Prochilodus lineatus exposed to a commercial formulation containing fipronil

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Aquatonic environments and their biota are constantly submitted to the contamination by pesticides. A large quantity of pesticides enter in these environments through the direct application of the product in water, residues of washing and packaging as well as superficial infiltration and drifting. In Brazil, insecticides with the active ingredient fipronil are among the most used at the moment. The degradation period of fipronil, under aerobic conditions, is 120 days. This data becomes alarming if we observe that the safety interval for re-applications is, on average, 30 days; consequently, during a cultivation cycle the presence of the product in agricultural areas is practically constant. Thus, the present study aimed to evaluate biochemical biomarkers in the Neotropical freshwater fish Prochilodus lineatus exposed to a fipronil based insecticide. We used an available commercial formulation (REGENT 800 WG), containing 80% fipronil. Thus, juveniles of P. lineatus were exposed to two concentrations of the commercial formulation containing fipronil. Isomers were present in highest amounts in gills, the organ in direct contact to waterborne ES, suggesting recent uptake. The presence of coadypsants appears to increase bioaccumulation of ES-S, particularly in liver and brain.

TP040. Biochemical changes in Prochilodus lineatus after acute and sub-chronic in situ exposure in agricultural area in southern Brazil

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The objective of this work was to assess biochemical parameters related to detoxification and antioxidant defenses in the freshwater fish Prochilodus lineatus subjected to acute and sub-chronic in situ tests in an area that receives inputs of agricultural contaminants in northern Paraná, southern Brazil and verify how organisms respond upon exposure over time. The fish farming station of the State University of Londrina (EPUEL) supplied juveniles of P. lineatus for the in situ experiments, in which fish (n=500) were confined in a large cage (6000 L). In situ tests were run at EPUEL (CTR) and in a lake in a region of intense agricultural activity (EXP). During the tests, fish remained in contact with the sediment in order to allow that fish have access to the substrate, as well as food supplementation through commercial feed three times a week. After four periods of caging (5, 15, 30 and 60 days) a number of a fish (n = 50) was removed from the cages and immediately transported to the laboratory. At the laboratory, fish were sampled and the livers were removed for analysis of the following biochemical biomarkers: the content of reduced glutathione (GSH) and subproducts of lipid peroxidation (LPO) and protein carbonyls (PCO), and the activities of glutathione-S-transferase (GST), catalase (CAT), superoxide dismutase (SOD) and glutathione peroxidase (GPX). In comparison to the CTR groups, fish from EXP group showed an increase of 32, 20 and 29% of GST activity after 5, 15 and 60 days exposure respectively, and increase in CAT (20%) and GPX (15%) activity after the first five days of exposure. Similarly, there was an increase in the content of the non-enzymatic antioxidant (GSH) after 15 (24%), 30 (28%) and 60 (100%) days of confinement. In relation to oxidative damage there was an increase of LPO products after 5 (320%), 15 (86%) and 60 (62%) days of exposure, as well as an increase of 32% in the PCO level after 15 days and 35% after 60 days. The results of the biomarkers indicated that animals caged in the experimental site showed an increase in their biochemical defenses compared to those from the CTR group, indicating a possible adaptive respond to the contaminants possibly present in the agricultural site. In despite of these biochemical responses, oxidative damage occurred, as indicated by increased LPO and PCO levels. The results of the biomarkers indicated that animals caged in the experimental site showed an increase in their biochemical defenses compared to those from the CTR group, indicating a possible adaptive view to the contaminants possibly present in the agricultural site. In despite of these biochemical responses, oxidative damage occurred, as indicated by increased LPO and PCO levels.


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Se estudió el impacto de agroquímicos en aguas superficiales en la zona núcleo de producción agrícola extensiva convencional del NNO de la provincia de Buenos Aires, Argentina, caracterizada por importante dependencia del uso de agroquímicos. El objetivo del trabajo fue evaluar los efectos biológicos asociados a sedimentos de fondo, como sumidero de plaguicidas. Se seleccionaron tres sitios de muestreo al norte de la provincia de Buenos Aires, en las localidades de Salto (SS), Arrecifes (AS) y Pergamino (PS), con actividad agrícola exclusiva. Se realizó dos muestreos en 2014, el primero a finales del periodo estival coincidiendo con la época de mayor aplicación de agroquímicos y el segundo en invierno. Muestras integradas de sedimentos de fondo fueron ensayadas en laboratorio para evaluar efectos con bioensayos de toxicidad crónicos (21 días) utilizando el antípodo Hyallela curvispina y el gasterópodo Physa acuta, analizando mortalidad y crecimiento como puntos finales. Complementariamente se determinó materia orgánica y granulometría, además del contenido de insecticidas y herbicidas de uso frecuente. Se utilizaron dos sedimentos de referencia (del sitio de estudio y del A° Juan Blanco utilizado como control en estudios previos). Los sedimentos se caracterizaron como franco contaminados con materia orgánica y granulometría, además del contenido de insecticidas y herbicidas de uso frecuente. Se utilizaron dos sedimentos de referencia (del sitio de estudio y del A° Juan Blanco utilizado como control en estudios previos). Los sedimentos se caracterizaron como franco contaminados con materia orgánica y granulometría, además del contenido de insecticidas y herbicidas de uso frecuente. Se utilizaron dos sedimentos de referencia (del sitio de estudio y del A° Juan Blanco utilizado como control en estudios previos). Los sedimentos se caracterizaron como franco contaminados con materia orgánica y granulometría, además del contenido de insecticidas y herbicidas de uso frecuente. Se utilizaron dos sedimentos de referencia (del sitio de estudio y del A° Juan Blanco utilizado como control en estudios previos). Los sedimentos se caracterizaron como franco contaminados con materia orgánica y granulometría, además del contenido de insecticidas y herbicidas de uso frecuente.

TP042. Biomarker responses elicited by a commercial formulation of Fipronil in a native species (Cyphocharax voga) after branchial ex vivo exposure

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Fipronil is a current use pesticide whose toxicity is still unknown in many non-target organisms (eg, fishes). Gills are considered the first organ where insecticides impact in aquatic organisms, therefore gill biomarker responses could be indicative of the immediate damage produced in fish. In this context, the biomarker responses promoted by a commercial formulation of the insecticide fipronil (CLAP) were evaluated in juveniles of C. voga using a branchial ex vivo exposure model. After sacrificing the animals, gill arches of each individual were collected. Endosulfan a and fipronil were added to the water in the bioassay chamber at concentrations of 0.1 and 10 ppm for 24 h.

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The large hairy armadillo (Chaetophractus villosus) is an endemic mammal with a broader distribution in Argentina. Its distribution overlaps with regions of intensive agricultural activity. Consequently, some agrochemicals released to the environment may induce genetic alterations in this mammal. Up to the moment, no studies had been made concerning the possibility to apply biomarkers of genotoxic effect in C. villosus, as a consequence to the environmental action. The aim of this study was to determine the baseline values of genetic damage in this native species, in order to establish its suitability as a sentinel organism for monitoring environmental pesticide hazard. Cytotoxic (mitotic index (MI), index of blast formation (BI), replication index (RI)), and genotoxic biomarkers (percentage of chromosome aberrations (CA) and frequency of sister chromatid exchange (SCE)) were analyzed on peripheral blood lymphocytes culture. The MI, BI, and CA were performed in a total of 20 adults (10 females and 10 males) from different localities along the endemic species distribution [Bahía Blanca (n=2), General Madariaga (n=1), Loma Verde (n=3), Monteverde (n=4), Navarro (n=2), Pellegrini (n=1), Pipinas (n=1), Saladillo (n=3), and Santo Domingo (n=3)]. Also, from 6 adults (3 females and 3 males) chosen randomly RI (counted in 1,000 cells) and SCE (counted in 30 cells) were carried out. Values for positive control were established adding 0.3 μg/ml of mitomycin C to the culture after 24 h of incubation. Our results show in all studied individuals that BI (86.8 ± 5.59 blast/stem/total cells), MI (2.9 ± 1.37 metaphases/total cells) and CA (1.5 ± 0.84%) present statistically no significant differences respect to our historical controls (t=0.65, P=0.52, t=0.67, P=0.51 and t=0.49, P=0.62 respectively). RI was 1.7 ± 0.1 and the frequency of SCE was 7.4 ± 1.3/cell. All the biomarkers evaluated are quite stable among armadillos. These findings confirm the value of these short term tests as accurate screening tools for the evaluation of cytotoxic and genotoxic effects in C. villosus. This is the first reference of the application of these biomarkers in C. villosus and first in wild Xenarthra from Argentina. C. villosus may be considered a good biological model as sentinel organism in their natural distribution in order to monitor genotoxic xenobiotics as pesticides.

TP045. Comparative effects of glyphosate herbicides based on oxidative parameters and sperm quality in estuarine fish Jenynsia multifilta. J.A. Albañil Sánchez, Instituto de Ciencias Biológicas; C.D. Martíns, PhD student / Instituto de Ciencias Biológicas Among the glyphosate-based herbicides, Roundup® is the most widely used. The mode of action of glyphosate as an herbicide is the inhibition of EPSPS, a key enzyme involved in the biosynthesis of essential aminoacids in plants. However, recent studies have shown that glyphosate can affect animal species, considered as non-target species. Thus, the objective of this study was to analyze comparatively the effects of the glyphosate-based formulations, Roundup Original® (RO), Roundup Transorb® (RT) and Roundup WGR® (RWG) on oxidative parameters and sperm quality of Jenynsia multifilta, a fish species that inhabit regions of irrigated rice plantations in Rio Grande do Sul / Brazil, where these herbicides are released. For that, an acute (96 h) mortality test was performed with 0.5, 1 e 5 mg.L⁻¹ of glyphosate, calculated following its concentration in each formulation. Only at a concentration of 0.5 mg.L⁻¹ of glyphosate there was no mortality, however, above 0.5 mg.L⁻¹, RT caused higher mortality (N=10 fishes) than RO (N=10 fishes). In addition, there was an imbalance among antioxidant defenses and the generation of reactive oxygen species (ROS) with consequent damage in fish liver (lipid peroxidation - LPO). This situation was more evident in animals exposed to RO, where was observed an increase in ROS and a decrease in total antioxidant capacity at 24 h of test, that reflected in a significant increase in LPO at 96 h. With respect to sperm quality, only the motility analysis, mitochondrial functionality and DNA integrity of sperm were affected by the herbicides, being motility the most sensitive parameter since it was inhibited by glyphosate in the 3 experimental formulations (RO RT and RWG) at 24 and 96 h of exposure. In summary, we conclude that the glyphosate-based herbicides cause damage to the fish species J. multifilta, inducing oxidative stress and negatively influencing reproduction. As it is for the comparative analysis, the RT appears to be the most toxic since it causes increased mortality, however, when at non-lethal and environmentally relevant concentration such as 0.5 mg.L⁻¹ of glyphosate, RO which contains higher amounts of components called "inert", causes more oxidative damage. Conversely, 3 formulations affect sperm quality in the same intensity.
Uptake of pesticides by fish can occur following ingestion of feed containing a pesticide residue. Consequently, residues in a product of fish origin need to be evaluated. The QuEChERS method for the multi-class determination of 39 pesticides by LC-MS/MS and 30 pesticides by GC-MS in freshwater fish muscle tissue from the Uruguay River basin. Pesticides extraction effectiveness was evaluated at 0.05 and 0.01 mg/kg spiking levels and efficiency of the dispersive-solid-phase extraction (d-SPE) clean-up step was evaluated by comparing buffered (acetate) and unbuffered extraction and d-SPE clean-up steps. Analysis of pesticide residues was performed by GC-MS working in selected-ion monitoring (SIM) and LC-MS/MS working in multiple reaction monitoring (MRM) modes. Better recoveries and cleanliness of extracts were obtained with PSA and C18 during the d-SPE clean-up step. Most recoveries were in the range 70-120%, with relative standard deviation lower than 15% at 0.05 mg/kg spiking level for most pesticides. LOQs ranged 0.001 to 0.015 mg/kg. The proposed method was successfully applied to real muscle samples of different species with commercial and non commercial value and trophic level from Rio Uruguay and Rio Negro (Salminus brasiliensis), boga (Leporinus obtusidens), tararira (Hoplias malabaricus), sáhalo (Prochilodus lineatus), and vieja del agua (Hypostomus spp.). Detectable pesticide residues were observed. Associated agricultural practices and resulting exposure of fish will be discussed. [1] SANCO/11187/2013 Working document on the nature of pesticide residues in fish ACKNOWLEDGMENTS INIA FPTA, PEDECIBA QUIMICA

TP048. Ecotoxicological assessment of two glyphosate-based formulations (reference and equivalent) on non-target plants

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Introduction: Glyphosate-based herbicides are the most commonly used in the world over, likely because they are relatively non-toxic to non-target species. There are many glyphosate-based formulations commercially available competing for the same target and surface treated. Besides the ecotoxicological assessment of active ingredients of pesticides, the evaluation of formulations containing them is mandatory. The equivalent formulations must contain the same active ingredient and inert substances of the reference formulation and therefore, they exhibit the same or less toxicological and ecotoxicological behavior. Phytotoxicity data for non-target plants have been used in regulatory decisions to determine environmental hazard of pesticides formulations. Purpose: Evaluate the ecotoxicity of a reference glyphosate-based formulation, Roundup Original (RUP) and an equivalent formulation, Glyphosate AKB 480 (AKB) using seeds of lettuce (Lactuca sativa), cucumber (Cucumis sativus) and tomato (Lycopersicon esculentum). Methods: Acute phytotoxicity assay was performed according to Ecological Effects Test Guideline - Seed Germination/Root Elongation Toxicity Test (EPA, 1996) with some adaptations. Results: According to Blaise and Férard (2005), RUP showed no toxicity for cucumber and lettuce, but it was extremely toxic for tomato with EC50 of 12.78 mg/L. AKB was only highly toxic for cucumber with EC50 of 30.51 mg/L. Conclusion: Both formulations were phytotoxic for one seed species. Therefore, ecotoxicological assessment must be performed with different species of non-target plants in order to ensure environmental health.

TP049. Efectos del herbicida imazapir en la actividad microbiana del suelo

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La degradación de un herbicida determina su persistencia en el suelo, así como la adsorción determina la disponibilidad del mismo en el suelo para la degradación y lixiviaciión a aguas subterráneas. Imazapir (IMZ) es un herbicida perteneciente a la familia de las imidazoliones, utilizado para el control de malezas en el cultivo de girasol CL. Tiene un alto potencial de lixiviación debido a una baja capacidad de adsorción, y es muy persistente en el suelo, pudiendo además causar carryover en cultivos subsiguientes. La degradación del IMZ en el suelo es principalmente por acción de los microorganismos. Entender los pasos de la misma es importante para predecir su comportamiento en el ambiente. El objetivo del presente trabajo fue estimar, a escala de laboratorio, cómo la presencia del IMZ afecta la actividad microbiana en un suelo. Las muestras de suelo fueron recolectadas en la EEA Anguil, La Pampa, a cuatro profundidades (0-0.75; 7.5-20; 20-40; 40-60 cm). El ensayo de incubación se realizó a una temperatura de 20ºC y dos niveles de humedad: 70% de la capacidad de campo (C.C.) y punto de marchitez permanente (P.M.P.). Se realizaron dos tratamientos; uno con muestras de suelo tratadas con IMZ (cIMZ) y otro con muestras no tratadas con IMZ (sIMZ). La actividad microbiana fue determinada por la captura y cuantificación del dióxido de carbono (CO2) generado por la respiración microbiana a los 7, 14, 21, 28, 35, 39, 47 días. Los resultados fueron analizados estadísticamente con un análisis de varianza (ANOVA) con dos factores (tratamiento y profundidad) y un modelo con covariables. En los diferentes tratamientos cIMZ y sIMZ, no se observó diferencias significativas en la producción de CO2 acumulado, aunque si se observó interacciones tratamiento*humedad*profundidad con p<0.05. Analizando por separado el tratamiento cIMZ presentó interacciones profundidad*humedad, con diferencias significativas (p<0.05) entre los primeros 20 cm (0-7.5; 7.5-20 cm) con una humedad al 70% de C.C., y el resto de las profundidades: 20-60 cm (al 70% C.C.) como a 0-60 cm (P.M.P.). Para el tratamiento sIMZ existen diferencias significativas con la profundidad (p<0.05), entre los primeros centímetros (0-7.5 cm) y el resto de las profundidades (7.5-20; 20-40; 40-60 cm).

TP050. Effect of sub-chronic exposure to the organophosphate azinphos-methyl on the native gastropod Chilina gibbosa

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Azinphos-methyl (AZM) is an organophosphate insecticide widely used in fruitculture. Maximum concentrations of 22 µg/L have been reported in Argentina’s freshwaters during application periods. Chilina gibbosa is a freshwater snail naturally exposed to this pesticide. Previous work published by our team found that Cholinesterases (ChEs) of this species are very sensitive to acute exposure to AZM. When snails were exposed to 20 µg/L, an inhibition of 85% of ChE activity and severe signs of neurotoxicity were observed. On the contrary, Carboxiesterases (CES) were not modified. Our aim was to determine the effect of a sub-chronic exposure (21 days) to AZM on these biomarkers. To this end, 4 recipients containing 7 snails each were used; 6 solvent control recipients and 6 with AZM (20 µg/L). All recipients were oxygenated throughout the experiment. The snails were fed once a week and a water was changed every 4 days, renewing the pesticide. On the 7th, 14th and 21st days we registered lethality and neurotoxicity signs, as well as ChE activity, using acetylthiocholine, and CE activity using p-nitrophenyl butyrate (p-NPB) and p-nitrophenyl acetate (p-NPA) as substrates. Lethality was observed on the 21st day with a loss of 18% of exposed snails. On the 7th day signs of neurotoxicity were observed: 90% of organisms lost adherence to the walls and 100% presented the cephalo-pedal region abnormally exposed. Also ChEs inhibition was more than 85%. None of the CES affected during the experiment. On the 7th day, ChEs were inhibited after 14 days of exposure (approximately 30% using p-NPB and 40% using p-NPA). Results suggest that an environmental concentration of AZM has a progressive effect that can be lethal. On the one hand, ChEs were strongly inhibited after 48 hours of exposure whilst CES activity was affected after a longer period of exposure.

TP051. Effects of Glyphosate and Roundup® Ultramax formulation on liver histology of Leptodactylus latrans tadpoles (Amphibia: Anura)

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In the last years, the agricultural expansion has led to the increased use of pesticides, with glyphosate as the most widely used herbicide worldwide. This is also true in Argentina, where glyphosate formulations are the most commercialized herbicide. It is known that glyphosate formulations are much more toxic than the active chemical (glyphosate technical grade), and these differences in toxicity can be attributed to the adjuvants. In this context, the aim of the present study was to evaluate sublethal histological effects of the glyphosate formulation Roundup Ultramax and technical grade glyphosate on Gosner-stage 36 Leptodactylus latrans tadpoles. Semi-static bioassays were performed using 96 h of exposure with Roundup Ultramax formulation (Monsanto) (0.37-9.62 mg a.e./L) and technical grade glyphosate 95.1% (Gleba) (10-1000 mg/L). A control group was included using filtrated and de-chlorinated tap water. The bioassays were conducted with 4 replicates by concentration in
glass chambers with 500 ml of solution and 5 larvae each. Mortality was registered every 24 h, prior to the media replacement, and dead individuals were removed. At 96 h, all living tadpoles were euthanized by benzocaine solution, fixed in Bouin’s solution and preserved in ethanol 70%. Larval body were embedded in paraffin, serially sectioned at 6 μm and stained with hematoxylin and eosin. Ten transverse sections, taken every 12 μm, were observed for each individual according to cone in order to detect anomalies caused by exposure to the herbicide. Heart, digestive tract and liver were observed, and special attention was taken on the liver, due to its known detoxifying activity. The number of liver melanomacrophagic cells (MMc) and of melanomacrophagic centers per liver area, were determined using Image-Pro Plus program. Data were analyzed by Kruskal-Wallis test followed by Dunn’s post hoc test in order to detect differences compared to control group. No anomalies were detected either in the heart or in the digestive tract of treated tadpoles compared to control ones. However, livers of tadpoles exposed to Roundup (5.18 mg a.e./L) and to glyphosate technical grade (1000 mg/L), presented an increase of MMc (> p< 0.0001) and of MMc centers (> p< 0.0001) and then more melanin pigmentation in the liver. These results indicates that MMc, MMc centers and melanin contained in MMc, could be protecting the tissue from some kind of damage induced by Roundup formulation and glyphosate technical grade.

TP052. Effects of glyphosate on ovarian maturation of Neohelice granulata adult females.

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An in vivo, semistatic bioassay was carried out during the entire pre-reproductive season (92 days) of adult females of the estuarine crab Neohelice granulata (10.42 ± 0.14 g of body weight). Fifteen females were assigned to each of the following glyphosate (acid form) nominal concentrations: 0.1, 1 and 2.5 mg/L. A dilution water control group was also run. Each female was placed in a glass recipient filled with 400 mL of artificial saline water (12 g/L), pH was always set at 7.8 ± 0.1. Continuous water aeration, as well as controlled conditions of temperature (22 °C) and photoperiod (14:10 L:D) were mainly used. During the assay, animals were fed twice a week with food pellets and fresh leaves of Elodea sp. dipient. Replacement of test solutions was made twice a week. At the end of the assay, ovaries from all females were dissected, weighed and fixed for histological analysis, in order to quantify the proportion of each oocyte type in the ovary (pre-vitellogenic, intermediate or vitellogenic), as well as the proportion of reabsorbed oocytes. The gonadosomatic index (ovarian weight/ body weight x 100) of females exposed to any glyphosate concentration was lower than that of control, although significant (p< 0.05) differences were found only at the highest glyphosate concentration. Correspondingly, at this concentration a significant (p< 0.05) lower proportion of vitellogenic oocytes was observed, compared to control, together with a significantly (p< 0.05) higher increase in the proportion of reabsorbed oocytes. These results stress the risk of glyphosate as active principle of any commercial formulation) to the reproductive potential of the wild crustacean species studied.

TP053. Effects of thiamethoxan in the proboscis extension reflex of Scaptorhynchus postica bees Latreille, 1807 (Hymenoptera, Apidae, Meliponini)

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Stingless bees are remarkable pollinators of native vegetation and also of important agricultural crops. The indiscriminate use of pesticides has caused the decline in the number of these pollinators. This study aimed to evaluate the effects of thiamethoxan insecticide on the behavior of bees S. postica by evaluating the reflection of the proboscis extension (PER). The PER test aims to reproduce in laboratory conditions, the bee-flower interaction in which the bee when stimulated by nectar extends its proboscis and stores the floral odor, allowing the recognition of this food source in the next foraging. Initially the bees were exposed to a concentration (p< 0.05) lower than the expected lethal concentration (LC50), and behavioral analysis were performed after 1, 4 and 24 hours. After this period the bees were placed in Eppendorf tubes and sucrose solutions were offered (0.1; 0.3; 1; 3; 10; 30; and 50%). The results of this study showed that the treated bees had behavioral change from the control, and, for some sucrose concentrations, the bees did not respond. Our results showed that the insecticide in question interfere with the ability of stingless bees to extend the proboscis in response to a food source, a fact that could impair the performance of these as pollinators. Financial support: CNPq (560205/2010-4; 161936/2013-10; 104639/2015-6) and FAPESP (2012/50917-2)

TP054. Embryotoxic evaluation of the insecticide Chlorpyrifos and pesticide mixtures on Caiman latirostris, through biomarkers of genotoxicity.


The aim of this study was to evaluate the effects of embryonic exposure to different concentrations of the widely used commercial formulation Chlorpyrifos (Lorsban 48E® -CPF, 48%) and a complex pesticide mixture consisting of Cypermethrin (Atanor® -CYP, 25%) + Glyphosate (Roundup Full II -GLY, 66.2%) + Chlorpyrifos (Lorsban® 48E® -CPF, 48%) on C. latirostris. The study was carried out under the “Proyecto Yacaré” (Gob. Santa Fe/MUPCN) facilities. Experiments were performed on embryos of C. latirostris exposed topication. Eggs were randomly distributed into seven experimental groups (N= 84; 12 eggs per experimental group with two replicates of 6 eggs each): 1) a negative control (NC) treated with distilled water; 2) a vehicle control (VC) treated with ethanol; 3-6) 4 groups exposed to 1, 10, 100, and 1000 µg/egg of CPF formulation; 7) a complex mixture (M) treated with: 10 µg/egg of CPF (Lorsban 48E®, 48%) + 10 µg/egg of CYP (Atanor®, 25%) + 500 µg/egg of GLY/Roundup Full II (66.2%). The eggs were incubated in an artificial incubator, under controlled conditions of temperature of 31 ± 1 °C and 95% humidity. At the end of incubation period, hatching success was registered and blood samples were obtained from the spinal vein of all neonates for the application of genotoxicity biomarkers on erythrocytes: Micronucleus and Nuclear Abnormalities test. The results showed a higher MN frequency at all concentrations of CPF tested and the mixture, respect to NC (p< 0.05), but no differences were observed in other nuclear abnormalities. Caimans exposed to the mixture did not show higher damage than those exposed to any concentration CPF alone (p>0.05). These findings agree with previous studies reported by our research group for this and other reptile species exposed to organophosphate pesticides formulations. Glyphosate, Cypermethrin and Endosulfan. This research shows the importance of using biomarkers of genotoxicity as potential tools for assessing embryotoxicity and to better understand the effects of contaminants on wildlife environmentally exposed.

TP055. Evaluación de la actividad antifúngica de los metabolitos producidos por bacterias aisladas de suelos.

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La exploración de la diversidad microbiana y la cantidad de metabolitos secundarios producidos por bacterias ha llevado a considerarlos como una fuente importante de productos naturales con propiedades biológicas como antitumorales, hipocolesterolémicos, inmunosupresores, antibacterianos, antiparasitarios, insecticidas y antifúngicos. El objetivo del presente trabajo fue evaluar la actividad antifúngica de los metabolitos secundarios producidos por bacterias aisladas de diferentes suelos agrícolas en el estado de Puebla, México. Se colectaron muestras de suelos agrícolas en las localidades Coatepec, La Malínche, Tlaxcala y Tetela de Ocampo, transportándose inmediatamente en bolsas oscuras y a temperatura ambiente al laboratorio, con la ayuda de medios microbiológicos enriquecidos y selectivos se aislaron diferentes muestras bacterianas, a las cuales se les hizo crecer en caldo nutritivo adicionado de la resina Amberlite® XAD-16N a una temperatura de 30ºC en agitación durante 24 horas. A continuación se lava la resina con una solución de etanol al 99% para obtener los metabolitos secundarios. A estos extractos obtenidos se les realizó extracción de proteínas para evaluar su perfil por medio de cromatografía en acrilamida. Los metabolitos obtenidos se evaluaron en vitro contra Alternaria sp y Fusarium sp, por los métodos de pozos y de discos de papel. Los géneros aislados de las diferentes muestras corresponden a Enterobacter, Citrobacter, Pseudomonas y Escherichia. Los perfiles proteicos muestran productos con pesos moleculares entre 50 y 130 kDa. Los ensayos contra Alternaria sp y Fusarium sp mostraron que los metabolitos retarden su crecimiento durante los primeros 5 días respecto a los controles, de tal forma se considera incrementar la concentración de los metabolitos para verificar dicha actividad. Los datos obtenidos permitirán ofrecer una alternativa para el control biológico en campo, evitando así la exposición a compuestos químicos y los efectos negativos que estos condicionan. Favoreciendo así el uso de productos naturales y ayudando a concientizar a los.
El imidacloprid es uno de los insecticidas más utilizados a nivel mundial para el control de plagas agrícolas. Si bien surgió como una alternativa selectiva dentro de los insecticidas convencionales, en los últimos años la toxicidad de este compuesto sobre la biota no blanca está siendo evaluada y reconsiderada. La valoración ecotoxicológica de efectos de compuestos puros sobre organismos diagnóstico es una herramienta apropiada para cuantificar su toxicidad. Sin embargo, dado que en general este tipo de estudios se realiza en condiciones controladas de laboratorio utilizando medios estandarizados, resulta de interés valorar condiciones más cercanas a las reales de campo. El objetivo del presente trabajo fue evaluar la toxicidad diferencial del insecticida imidacloprid en agua de red declorinada y agua de un arroyo representativo de la región pampeana (Argentina), utilizando ensayos estandarizados con Daphnia magna y Lactuca sativa. Para ambos organismos se realizaron ensayos estáticos, evaluando como punto final letalidad a 48h con D. magna e inhibición de la germinación, de la elongación de la raíz y de la hipocótil a 120h de exposición con L. sativa. Se utilizó como medios de ensayo: agua de red declorinada y agua natural obtenida de la cabecera del arroyo el Destino, provincia de Buenos Aires, seleccionado por su baja actividad antrópica y utilizado habitualmente como sitio blanco. Los medios de ensayo fueron caracterizados y en cada caso, se realizó la curva de concentración-respuesta, comparando la toxicidad relativa en cada medio de dilución a partir de las concentraciones que causan el 50% de efecto. Para ambos organismos se observó mayor toxicidad de imidacloprid para los ensayos en agua declorinada, evidenciando un efecto protector del agua de arroyo hacia los organismos. Estos resultados podrían estar indicando un cambio en la biodiversidad del imidacloprid en las condiciones comparativas estudiadas. 

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TP056. Evaluación de la toxicidad del imidacloprid sobre Daphnia magna y Lactuca sativa en aguas naturales vs condiciones estandarizadas

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El Cinturón Hortícola y Florícola Platense (CHFP) es uno de los más importantes en diversidad de especies cultivadas, suponiendo consecuentemente la utilización de una amplia diversidad de agrónomos. La evaluación de impactos de agroquímicos sobre el ambiente se orienta en general a medir concentraciones en el ambiente, sin aportar información acerca de los efectos sobre la biota. El objetivo del trabajo fue realizar un diagnóstico integral de la calidad de un cuerpo de agua, analizando agua y sedimentos, asociado al CHFP, utilizando una batería de ensayos agudos con Lactuca sativa, Daphnia magna y Hyalella curvispina en agua y H. curvispina en sedimentos. Los sitios de muestreo se ubicaron en la cuenca alta del Arroyo Carnaval donde predomina la horticultura. Se realizaron 3 campañas de muestreo en verano tomando en cada caso muestras de agua y sedimento en 4 sitios: M1 y M2 en un brazo del arroyo con vegetación acuática abundante; M4 en otro brazo del arroyo sin vegetación; y M3 luego de la unión de los brazos, habiendo realizado 2 campañas de muestreo en verano tomando en cada caso muestras de agua y sedimento en 4 sitios: M1 y M2 en un brazo del arroyo con vegetación acuática abundante; M4 en otro brazo del arroyo sin vegetación; y M3 luego de la unión de los brazos. Se midieron parámetros generales de agua in situ (T°, OD, CE, pH y SDT) y sedimentos (MO y granulometría). Se realizaron ensayos siguiendo protocolos estandarizados existentes. Con las muestras de agua de la primera campaña se observó toxicidad sobre D. magna en los sitios S3 y S4 (70% y 30% de mortalidad) y sobre H. curvispina en el sitio S2 (80% de mortalidad). En la segunda campaña no se observó toxicidad en ninguna de las muestras con ambos organismos. Para L. sativa se observó un aumento significativo de la elongación radicular para todas las muestras de ambos muestreos. Mientras que la muestra correspondiente al S3 del segundo muestreo indujo además un aumento en la elongación del hipocótil. Con respecto a las muestras de sedimentos se observó toxicidad en los sedimentos del sitio S1 en la segunda campaña (100% y 70% de mortalidad). Sin embargo, no se observaron efectos en los antídodos expuestos a las muestras M2, 3 y 4. Los resultados evidenciaban la importancia de utilizar una batería de bioensayos sobre diferentes matrices del cuerpo de agua. Los sedimentos de fango, se comportarían como sumideros de plaguicidas, siendo los efectos en la columna de agua detectables a corto plazo.

TP057. Evaluación integrada de la toxicidad de agua y sediment de arroyos asociados al Cinturón Hortícola Platense

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TP058. Evaluation of the toxic potential of a commercial formulation of the 2,4-D herbicide using the micronucleus test in Tradescantia (Trad-MCN)

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The herbicide 2,4-D was introduced in the 1940s and after more than 50 years of use, it is still widely used worldwide. Due to the wide use of this pesticide, the investigation of its toxicity is necessary and prudent, since it can affect different organisms. The higher plants are direct biological receptors of pollutants and are considered good biological indicators. Allium cepa, Vicia faba and Tradescantia spp are plants commonly used in evaluating toxicity of different compounds and biomonitoring several ecosystems. The micronucleus test performed in Tradescantia (Trad-MCN) was initially developed with clone #8430, a hybrid between T. hirsutiflora and T. subacaulis species. However, the species T. pallida started to be used in this test successfully in Brazil in recent years. Given the above, the present study aimed to investigate the toxicity of the commercial 2,4-D herbicide DMA 806 BR in the Trad-MCN test in T. pallida. To evaluate its effects three concentrations were tested: field concentration, half and a quarter of field concentration. For the test 10 young flowers stems with closed buds were collected and exposed to three different concentrations of 2,4-D commercial for 8 hours, followed by 24 hours recovery in distilled water under constant aeration. The positive control was done with methyl methane sulfonate positive control (7.7 x 10^-3 ml/l) and negative control in distilled water. Three thousand tetrads were counted per treatment. Data distribution for normality was analysed with the Shapiro-Wilk test and the Kruskal-Wallis/Dunn (p< 0.05) nonparametric test. The statistical analysis was performed by comparing the results of the treatments with the negative control. The two highest doses of the commercial herbicide significantly induced micronucleus formation. Therefore, the tested herbicide was genotoxic, as it induced changes in the genetic material of the T. pallida. Given that this herbicide has been used for several decades, our findings reinforce the warning that this compound and other pesticides, while important for agriculture, must be used with caution. Financial support: CAPES and FAPESP proc. 2012/50197-2.
20 200 parts per billion (ppb) (Atrazine groups) and 65, 650, 6500 (glyphosate groups) parts per billion (ppb). The genotoxicity of turtle cells were analyzed with the Micronucleus test. According to the results of the study, the atrazine and glyphosate exhibited an increase in their frequency of micronuclei compared to specimens from control group (p<0.01). Significant increases in the frequency of micronuclei occurred in turtles from eggs incubated with glyphosate. It is possible to observe higher frequencies of MN in glyphosate in concentrations equal to 6500 parts per billion (ppb). This data suggest that the turtles have different sensitivities in relation to atrazine and glyphosate. TP060. Genotoxic studies of auxinic herbicides in the ten spotted live-bearer fish Ctenodon decemmaculatus

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Pesticides may be introduced into the aquatic environment since they are applied directly on surface water to control aquatic weeds or via air onto crop fields. Indirect entrance into the freshwater environment is associated with runoff, erosion and leaching events resulting from terrestrial application. They may provoke harmful effects on the fish population and other aquatic organisms contributing to long-term effects in the environment. Herbicides are classified as auxinic based on their growth-promoting effects observed in plant cells, specific tissue systems, and in whole plants. Generally, the auxinic herbicides are used to selectively control broadleaf weeds in grass crops such as cereal grains and turfgrass swards. These agrochemicals are usually applied as foliar treatments but at higher doses can be used as pre-emergent treatments. Although they continue to be a very important class of herbicides, their precise mode of action is still unknown. In plants, these chemicals mimic the action of auxins, hormones that stimulates growth, but in mammals and other species no mimetic hormonal activity has been reported. The aim of the present study is to evaluate the acute sublethal genotoxic effects exerted by two auxinic technical formulations commonly used in Argentina, namely Banvel® (57.7% dicamba-based formulation) and 2,4-D DMA® (58.4% 2,4-D-based product) on piscine circulating erythrocytes in vivo. The alkaline single cell gel electrophoresis (comet) assay was employed as endpoint for genotoxicity in specimens of C. decemmaculatus (Pisces, Poecilidae) in laboratory conditions. Specimens were exposed during 48 and 96 h within the 427-1281 mg/L or 252-756 mg/L of Banvel® and 2,4-D DMA® concentration-ranges, respectively. Negative (dechlorinated tap water) and positive (10 mg/L cyclophosphamide) controls were conducted and run simultaneously. Results demonstrated a significant increase of the genetic damage index in all treatments lasting for both 48 and 96 h (P<0.001), regardless of the herbicide assayed. Rather than demonstrating the induction of DNA single strand breaks and/or alkaline labile sites induction by the herbicides, this study represents the first evidence of sublethal effects exerted by Banvel® and 2,4-D DMA® on a piscine species native to Argentina. Finally, our findings highlight the properties of these auxinic herbicide-based formulations that jeopardize nontarget living species exposed to these agrochemicals. TP061. Histopathological effect of cypermethrin on the apple snail Pomacea canaliculata (Mollusca: Gastropoda)

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Cypermethrin (CYP) is a pyrethroid pesticide widely used in Argentina agriculture. The objective of this study was to evaluate histological changes in the digestive gland, gill and foot of Pomacea canaliculata exposed to CYP (Glaxa, S.A.). Animals were exposed to three CYP concentrations (10, 25 y 100 μg/L) during 4, 7 y 14 days and their respective controls without pesticide were included in the analysis. A stereological procedure was applied in order to quantify the volume density of the different cell types and the percent of surface occupied by pigmentated corpuscles was estimated. The digestive gland of P. canaliculata consisted of numerous blind ending tubules that were composed of digestive cells and basophilic cells. The digestive cell was the more frequent cell type observed in control groups. In the exposed groups, irrespective of the concentration, an increase in the number of basophilic cells was recorded. An increment in the surface occupied by pigmentated corpuscles with increasing dose was observed for all the exposure time. The gill filament of the control snails is formed by numerous ciliated columnar epithelial cells. In the exposed snails, irrespective of the concentration, the gills exhibited a reduction in length or loss of cilia, the columnar cells became highly vacuolated and an increase in haemocyte content was observed. Based on the normal morphology of the foot, after 7 and 14 days exposure to 100 μg/L of CYP a disruption in the columnar muscle fibres and an increase in the lipid vacuoles and mucocytes were observed. All the histopathological observations indicated that the exposure to sublethal concentrations of CYP cause several damages in the body tissues of the apple snail P. canaliculata and we propose that this species could be used as biomonitor of pyrethroid contamination in aquatic ecosystems. This work is part of a larger one in which metabolic alterations of exposed snail to CYP were studied, in terms of the oxidative damage and enzymatic activity. TP062. Glyphosate and oxidative stress in fish

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Glyphosate (GP) is used worldwide as a non-selective herbicide. Colombia applied for more than twenty years the aerial spraying of GP to eradicate illegal crops (e.g. coca and poppy plants). Recently, WHO classified GP as a 2A unknown. In plants, these chemical mimics auxins, hormones that promote cell growth. XP auxinic herbicides, their precise mode of action is still unknown. In plants, these chemicals mimic the action of auxins, hormones that stimulate cell growth, but in mammalian species no mimetic hormonal activity has been reported. The aim of the present study is to evaluate the acute sublethal genotoxic effects exerted by two auxinic technical formulations commonly used in Argentina, namely Banvel® and 2,4-D DMA® on a piscine species native to Argentina. Finally, our findings highlight the properties of these auxinic herbicide-based formulations that jeopardize nontarget living species exposed to these agrochemicals. TP063. Histopathological effect of cypermethrin on the apple snail Pomacea canaliculata (Mollusca: Gastropoda)

Adult females (10.86 ± 0.08 g) of the estuarine crab Neohelice granulata were exposed for 12 wk (June to September) to Atrazine at 0.03, 0.3 and 3 mg/L of atrazine as active principle in the commercial formulation. A control group with no atrazine added was also run. Fifteen animals were randomly assigned to each treatment. Each female was isolated in a glass recipient filled with 400 mL of artificial saline water, at 12 °C, under continuous aeration and controlled conditions of temperature (22 °C) and photoperiod (14:10 L:D). During the assay, animals were fed three times a week with food pellets and fresh leaves of Elodea sp., renewing all test solutions twice a week. At the end of the assay, the ovary and hepatopancreas of all females were dissected, weighed and fixed in Bouin solution for histological processing. Females exposed to the highest concentration of atrazine (3 mg/L) had a hepatic index 50% lower than that of control females. Histological analysis indicated that females exposed to the same atrazine concentration had a reduced proportion of vitellogenic oocytes with respect to control, together with a significantly (p<0.05) higher proportion of reabsorbed oocytes. No differences were observed among treatments concerning the hepatopancreatic index. The analysis of hepatopancreatic cell types indicated a significant (p<0.05) reduction in the proportion of F-cells, in females exposed to the highest concentration of atrazine.
to 5 mg/L of atrazine. These results suggest an inhibition of ovarian growth by atrazine as a possible endocrine disruptor, in accordance with previous studies recently published.

TP065. Imazethapyr induces oxidative damage in DNA purines bases in Hypsipops pulchellus tadpoles (Anura, hyliidae) evaluated by the comet assay

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Imazethapyr (IMZT) [5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-4,5-dihydropyrimido[1H-2,3]-oxo nicotinimidac] is a member of the imidazoilone herbicides used to control grasses, broadleaved weeds, and others in a variety of crops and non crop situations. IMZT has been classified as a slightly toxic compound (Class III) by the USEPA. The European Union has classified the herbicide as a dangerous compound for the environment and has reported IMZT as a harmful irritant for the respiratory track, skin, and eyes, as well as classified by the European Union. IMZT is a selective post-emergent herbicide with residual action. Available data analyzing its effects in aquatic vertebrates are scarce. In previous studies we demonstrated that IMZT induces lesions into the DNA of Hypsipops pulchellus tadpoles using the single-cell gel electrophoresis (SCGE) assay as a biomarker for genotoxicity. Currently, this assay can be modified including incubation with lesion-specific endonucleases, e.g., endonuclease III (EndoIII) and formamidopyrimidine DNA glycosylase (Fpg) which detect oxidized purine and pyrimidine bases, respectively. The aim of this study was to evaluate oxidative DNA damage in circulating blood cells of H. pulchellus tadpoles exposed ex vivo to Pivo H0 (0.10% IMZT) at a concentration equivalent to 25% LCS0/96h (0.39 mg IMZT/L) by a pulse treatment of 1 h. H2O2 (50 μM) and phosphate-buffered saline were employed as positive and negative controls, respectively. The results revealed that a treatment with Fpg but EndoIII produces a significant increase in the genetic damage index of those peripheral blood cells of H. pulchellus tadpoles exposed ex vivo to IMZT-based herbicide commercial formulation compared with control values. The differences observed are significant (p < 0.05). Our results demonstrate that the herbicide induces oxidative DNA damage on H. pulchellus tadpoles at purine bases but not at pyrimidines. Furthermore, they represent the first evidence of oxidative damage caused not only by IMZT, in particular, but also by herbicides, in general, on anuran DNA using the alkali Endo III- and Fpg-modified SCGE assay.

TP066. In vitro and in vivo effects of Roundup on the ovarian growth of the estuarine crab Neohelice granulata

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The effect of Roundup Ultramax® (R-UP), one of the main glyphosate formulation currently used, was evaluated in vitro on ovian pieces of the estuarine crab Neohelice granulata, during the pre-reproductive period. Small pieces were incubated for 24 h in Medium199, inside a culture chamber held at 27°C and 5% CO2. Experimental groups comprised a control (vehicle) and three concentrations of R-UP: R-UP1 (0.0025 mg/L), R-UP2 (0.0125 mg/L) and R-UP3 (0.02 mg/L). These concentrations refer to glyphosate as active principle in the commercial formulation. Twelve females were used, each one providing biological material to every treatment (repeated measure design). Trinitiated leucine was added to each 2 mL-well, in order to estimate the incorporation of this amino-acid to de novo synthesis of ovarian proteins (i.e., mainly vitellins). At the end of the assay, ovarian pieces were homogenized, centrifugated and filtered, to finally counting the CPM in the acid precipitable fraction. A significant (p < 0.05) lower incorporation of leucine was observed in the ovarian pieces exposed to R-UP, with respect to control. By the same time, adult females of N. granulata (N=60) were exposed for 12 wk to the same concentrations assayed in pieces isolated of the same N. granulata females. All experiments were performed in artificial saline water at 12 g/L, under continuous aeration, temperature of 22°C and photoperiod 14:10 (L:D). At the end of the assay, ovaries of all females were dissected, fixed in Bouin solution and histologically processed. For each animal, all oocyte types (pre-vitellogenic, intermediate, vitellogenic and reabsorbed) were counted in three independent section of the ovary. Statistical analysis showed a significant (p < 0.05) higher proportion of reabsorbed vitellogenic oocytes in the R-UP3 treatment, compared to control. Taken together, the results obtained both in vitro and in vivo are indicating a deleterious effect of the highest concentration of R-UP on the ovarian growth of N. granulata, also suggesting that such effect of is directly exerted on the ovary.

TP067. The irradiation UVB and the oxygen modulators of the toxicity of glifosato

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Si bien es ampliamente conocido que los tóxicos afectan a los seres vivos interactuando con múltiples condiciones ambientales, la norma que regula el uso de agroquímicos se basa solamente sobre el efecto de la sustancia pura (principio activo) y en alguna(s) condición(es) acotadas, no necesariamente las más relevantes para objetivos de cuidado ambiental. La expansión de la frontera agropecuaria incorpora millones de hectáreas donde organismos no blanco son expuestos a agroquímicos siendo el glifosato uno de los mas utilizados. En el caso de embriones de anfibio la CL50 del glifosato IA resulto en 9, 8 y 6 las 96, 144 y 360 hs respectivamente. Los estudios larvaen presentaron una resistencia de hasta el 300% mayor que los embriones a este fitosanitario. En atención a que otros agentes ambientales tales como el UVB y el oxígeno disponible podrían modificar la toxicidad de este herbicida para organismos no blanco se trabaja con la etapa embrionaria de los anfibios (estadios de Opérculo Completo (E2S) en cámaras con niveles de hipoxia controlados con nitrógeno a valores de 3.5 y 5 mg/L de oxígeno durante 96hs mientras sus respectivos controles se mantuvieron en condiciones ambientales de laboratorio (9 mg/L de oxígeno). Las concentraciones de glifosato ingrediente activo (IA), empleadas fueron de 25 y 30 mg/L resultando que a las 24 hs se registró una sobrevivencia de 20, 80 y 40% para 3.5, 5 y 10mg/L de oxígeno en el medio de mantenimiento de los embriones para la concentración mas baja glifosato. Con 30 mg de glifosato/L a las 24 hs la sobrevivía fue de 5, 40 y 30% respectivamente. En ambos casos ampliar el tiempo de exposición a 96 no modificó significativamente la sobrevivía. La sobrevivida de los embriones controles en la etapa E2S se incrementó en la etapa de PCO (15 días) de 30% a 35% con 25 mg/L a las 24 hs. Exponiendo de una manera de 3556 J/m2 de UVB que resulta para los controles en una letalidad a las 24, 48 y 72 hs de 0, 26 y 54% y para los embriones pretratados con glifosato en 10, 53 y 80% respectivamente. Los resultados indican que factores ambientales tales como el UVB y fluctuaciones que podemos considerar habituales del oxígeno disuelto en los cuerpos acuáticos tienen una incidencia que puede incrementar en forma significativa la toxicidad de este agroquímico.

TP068. Mesotrione herbicide promotes biochemical changes and DNA damage in two fish species.

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Mesotrione is one of the new herbicides that have emerged as an alternative after the ban of atrazine in the European Union. To our knowledge, any work using genetic or biochemical biomarkers was performed in any kind of fish evaluating the toxicity of this compound. The impact of acute (96 h) exposure to environmentally relevant mesotrione concentrations (1.8, 7, 30, 115 and 460 μL/L) were evaluated on the liver of Oresorhinus niloticus and Geophagus brasiliensis by assessing the activity of superoxide dismutase (SOD), glutathione peroxidase (GPx) and glutathione-S- transferase (GST), the levels of reduced glutathione (GSH), carbonyl protein assay (PCO) and lipid peroxidation (LPO) as well as the DNA damage to erythrocytes, hepatocytes and gills cells through the comet assay. Exposure of animals to mesotrione triggered a defense response against ROS, as shown by a light increase of some systems including GPx activity and GSH content in O. niloticus, and GST and SOD activity in G. brasiliensis. Probably this response is enough to counteract ROS, because mesotrione only increased the LPO in the group 115 μL/L in G. brasiliensis, and any significant change was observed in PCO was detected for both species. However, DNA damage occurred in both species. This suggests that ROS is not the main mechanism of the herbicide to induce genotoxicity. Our data showed that the use of mesotrione in the crop fields must be closely observed. Despite its low concentration in nature, our results showed an increased DNA damage and oxidative responses in fish exposed to such low concentrations. Thus, in order to have a broader environmental knowledge of the real toxic potential of mesotrione, it is
necessary more studies with different species and different levels of contamination in order to better understand the toxicity of this compound, of its commercial formulation and of its metabolites. Keywords: mesotrione, herbicide, genotoxicity, fish, Neotropical, ROS

TP069. Modulation of immune and antioxidant responses to Escherichia coli by azinphos-methyl in the freshwater mussel Diplodon chilenis.

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The aim of this work was to characterize the immune response and the oxidative balance in Diplodon chilenis upon exposure to environmentally relevant concentrations of AZM. Mussels were collected from an unpolluted site and acclimated in laboratory for 3 days. Then, six groups were set: G1 Control: fed with the green algae Scenedesmus vacuolatus (Sv, 3 days), G2 Solvent control (Acetone + 0.01%, 3 days), G3) Exposed to Escherichia coli (50,000 cell/mL, 3 days), G4) AZM (0.2 mg/L, 3 days), G5) Acetone (3 days) and then E. coli (3 days), G6) AZM (3 days) and then E. coli (3 days). Data were analyzed by one-way ANOVA and post hoc comparisons. Results: Total hemocyte number tends to increase in all treated groups respect to G1. Cell viability showed no variation among treatments. Hyalocytes proportion decreased in treated groups, being significantly lower in G6 than in any other group. Granulocyte proportions showed the opposite trend to hyalocytes, with highest proportion in G6. Phagocytic activity in hyalocytes increased significantly in all treated groups with a peak in G4. Granulocytes phagocytic activity decreased in G2-5 respect to G1, and increased significantly in G6. Acid phosphatase activity increased in G3-6 respect to G1-2. Alkaline phosphatase and β-glucuronidase activity increased in all treated groups respect to G1, in both enzymes G6 had significantly lower effect than G5. ROS production increased in G3, 5, 6 with respect to G1, 4. TOSC tends to increase in most treated groups. Lysosomal membrane stability decreased in all respect to G1, G6 had lower effects G3-5). Bacteriolytic activity increased in G3, 5 and 6, while phenoloxidase activity decreased in G2, 4 and 6 compared to control groups. Gill GST activity increased in all treatments respect to G1-2. Gill lipid peroxidation decreased in G4-6 respect to the other groups. Gill carbonyl esterase activity was inhibited in G4 and 6, respect to G2. Conclusion: Short-term exposure to AZM stimulates cellular response, enhancing lysosomal membrane stability and TOSC. AZM also alters cellular proportion towards granulocytes and promotes granulocyte phagocytic activity. In contrast, AZM inhibits alkaline phosphatase and β-glucuronidase activities. ROS production and bacteriolytic activity are increased in all treatments with bacteria. Phenoloxidase activity decreases in treatments with pesticide or acetone. In gills, AZM stimulates antioxidant defenses and inhibits carbonyl esterase activity.

TP070. Pesticide analysis and ratio between ept/chironomidae in the watershed of Jacaré Peipá Mirim River in brotas (São Paulo/Brazil)

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In aquatic ecosystems, we found organisms with different degrees of sensitivity and that are exposed to environmental disturbances. The orders Ephemeroptera, Plecoptera and Trichoptera (EPT) are considered sensitive and require good quality water for their development and survival. On the other hand, the family Chironomidae, Diptera order, is composed of resistant animals, which develop and survive in contaminated waters. Due to these special characteristics, all these organisms can be used as indicators of water quality. The objective of this study was to analyze pesticides in water and sediment and determine the percentage of Chironomidae in EPT and, the reason between EPT and Chironomidae in the watershed of Jacaré Peipá Mirim River in Brotas (São Paulo state, Brazil). The collection of the macroinvertebrate community was held in three sampling points from August 2013 to July 2014, except in December 2013. The pesticides carboufuran, diuron, cypermethrin, deltamethrin, fipronil, lambda-cyhalothrin, permethrin, trifluralin and tebuconazole were analyzed in water and sediment samples. There were 5,920 macroinvertebrates distributed in 73 taxa. The pesticides concentration in the water was only in five samples, these situations happened in August (Points 1 and 2), September (Points 1 and 2) and November (Point 1) in 2013. In the other samples, the percentage of EPT was higher and ranged from 8.8% (October) to 47.9% (January). Any of the pesticides was quantified in water or sediment samples. The knowledge of the percentage of EPT and Chironomidae in environmental impact assessment studies is very important. EPT organisms are sensitive to disturbances in their habitats, and Chironomidae larvae are able to live in all kinds of aquatic environment, including the impacted ones. Negative values of the reason EPT/Chironomidae may indicate that the environment is undergoing changes, but other metrics are needed in conjunction with these results to conclude that the environment is impacted. ACKNOWLEDGMENTS: FAPEMA/EA (PROJECT RL 5061 and 7019)

TP071. Preliminary results of the relationship between ecotoxicological responses of fish from the genus Astyanax

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Astyanax is a neotropical genus of freshwater fish in the family Characidae with a wide distribution in the Americas. The genus has more than 100 species described and is considered an incertae sedis group due to the lack of a robust phylogenetic and taxonomic relationship among its members. Despite this issue, Astyanax is widely used in ecotoxicological studies, either in vivo or in situ. The aim of this study is to investigate the relationship between the ecotoxicological responses of Astyanax in order to understand how the different species respond to a same contamination scenario. For that, we analyzed a series of biomarkers (from genetic to physiological) in three different species of Astyanax (A. altiparanae, A. ribeirae and A. bifasciatus) submitted to two distinct bioassays (fish exposed to malathion and copper sulphate). We, hereby, present the first results obtained from the malathion assay with A. altiparanae and A. ribeirae. Neither of the chosen concentrations (100g/L-1, 150 µg/L-1 and 225µg/L-1) was sufficient to inhibit the cerebral and muscular activity of acetylcholinesterase (AChE) of any of the studied species. Nonetheless, we found that A. altiparanae has a significantly higher basal activity of AChE in comparison to A. ribeirae. Based on these considerations, this study aimed to assess comparatively the infection rate of Nosema sp. in nests of Apis mellifera that are naturally present in agricultural system and apiary: could the pesticides be interfering in their prevalence?

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In bees (Apis mellifera), Nosema is a microsporidium that infects the gut epithelial cells of the insect. The infection is caused by the ingestion of Nosema spores from contaminated food, such as honey. The presence of Nosema spores in bees can be a significant problem for beekeepers, as it can lead to a decrease in the population of bees and reduce honey production. Nosema infection is a major issue for beekeepers, as it can cause significant economic losses due to a decrease in the population of bees and reduced honey production.

TP072. Quantification of Nosema sp. spores in honeybees collected in agricultural system and apiary: could the pesticides be interfering in their prevalence?

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In agricultural systems, pesticides are commonly used to control pests and protect crops. However, these chemicals can have negative effects on the health and well-being of honeybees, which are essential pollinators for many crops. One of the most important diseases that affects honeybees is Nosema, caused by the microsporidian Nosema apis. This infection can lead to a decrease in the population of honeybees and reduced honey production.

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in agricultural area, where pesticides are frequently applied, and apiary that are located in a vegetation fragment dissociated of agriculture activities. The bees were collected at São Pedro Farm, where orange are cultivated by means of a conventional cropping system, located on the border of the cities of Sorocaba and Votorantim-SP/Brazil; and Bico Doce apiary in the municipality of Predade/SP/Brazil. On the farm, Apis mellifera foragers bees were captured with insect net in front of the hive, near to the nest. In the apiary, they were collected in the colony entrance. The abdomens of bees were macerated and processed for counting of Nosema spores in Neubauer chambers. The rate of infection in bees collected at the farm was 5,975×106 spores/bee (January) and 4,930×106 spores/bee (April), whereas this rate was 7,985×106 spores/bee (January) and 11,620×106 spores/bee (April) for the bees collected in the apiary. Samples of bees collected from apiary were sent to APTA (Agencia Paulista de Tecnologia dos Agroenérgicos) in Pindamonhangaba/SP-Brazil, for molecular diagnosis of the Nosema species by PCR-duplex, what detected the presence only of N. ceranae. The results showed a lower rate of infection in bees collected from crop than in bees collected from apiary. In commercial apiaries, Nosema could range high infection rate because of the management procedures of the colonies. In the case of bees collected from the farm, recent studies reveal that there are pesticides that increase the prevalence of Nosema, such as fungicides, but most of the insecticides usually decrease the prevalence of Nosema in honeybees. Additional factors could also be acting in the prevalence of Nosema in the colonies: pesticides, microclimatic factors, or the crop attacked. Each area will be affected in a different way due to the floral diversity and management of the colony. This study adds information to the hypothesis of multiple stressors on field conditions, which may contribute to the decline of bee populations.

TP073. Repelentes para cucarachas: una herramienta de control para disminuir el uso de insecticidas convencionales.

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El uso de repelentes como medida de exclusión spatial o como protección personal, es una herramienta complementaria para el manejo de plagas que minimiza el uso de insecticidas tradicionales, y el impacto ambiental que estos producen. Los piretroideos, además de su efecto insecticida, pueden repeler algunas especies de insectos. La cucaracha Blattella germanica es una plaga domiciliaria cosmopolita, que vive asociada a las poblaciones humanas. El objetivo de este trabajo fue estudiar el efecto repelente del piretroide d-altriana en B. germanica, comparándolo con el repelente de amplio espectro DEET, mediante dos vías de ingreso: por contacto con la cutícula o por medio del sistema olfativo. Se utilizaron soluciones de d-altriana (3; 11,5; 46 y 185 µg/cm²), y de DEET (3,5; 7; 30 y 700 µg/cm²). Para la determinación de la repelencia, machos de B. germanica fueron colocados individualmente sobre una arena experimental circular de 11 cm de diámetro, constuida por un papel de filtro dividido en mitades. Una mitad fue tratada con 0,35 ml de una solución de cada sustancia repelente y la otra con el mismo volumen del solvente. Después de una exposición in situ (periodo de 30 días) entre abril-diciembre 2014, en dos cultivos hortícolas de manzanos, utilizando un cultivo convencional con aplicación de plaguicidas y un cultivo orgánico libre de agroquímicos (certificado). Los resultados obtenidos indican una mayor actividad de carboxileras (medidos en μmol/mg*mg protéina) en los suelos con cultivos de manzano orgánico, y una reducción de la actividad de la enzima en el suelo de cultivo convencional, estas diferencias son mayores en el periodo de primavera y verano, donde las aplicaciones de agroquímicos son más utilizadas. Estas respuestas estarían evidenciando una inhibición de los plaguicidas sobre la síntesis de estas enzimas. Gracias a los resultados obtenidos podemos concluir que las carboxileras son sensibles a la acción inhibitoria de los plaguicidas. Por lo cuál, adquirir un cierto protagonismo en el seguimiento ambiental frente a la exposición de organismos no blandos y rol detoxicador a este grupo de agroquímicos.
CONICET La Plata UNLP / Instituto de Limnología Dr Raúl A Ringuelet ILPLA CONICET CCT La Plata UNLP

Argentina transformó su modelo productivo adoptando masivamente y en pocos años el paquete tecnológico caracterizado por soja transgénica, siembra directa y aplicación reiterada y creciente de agroquímicos, representando un riesgo para los cuerpos de agua superficiales. El objetivo de este trabajo fue estudiar la toxicidad aguda en agua y sedimento de insecticidas comúnmente utilizados en nuestro medio: cipermetrina, clorpirifos y lambdacyalothrin, sobre Hyalella curvispina, anfípodo de extensa distribución geográfica y normalmente abundante en la región pampeana. La presente contribución representa la primera referencia de toxicidad de insecticidas en sedimentos y de lambdacyalothrin para H. curvispina. Los individuos fueron obtenidos de un arroyo en cuya cuenca no se realiza agricultura, luego aclimatados en laboratorio. Los ensayos de toxicidad fueron realizados en agua reconstituida, moderadamente dura, siguiendo protocolos estandarizados, exponiendo diez ejemplares de H. curvispina por triplicado. En los ensayos de agua se comparó la toxicidad en organismos de distintos tamaños, con individuos tamizados entre 355-500 µm y entre 500-710 µm. En sedimento solo se utilizaron los individuos mayores. Las pruebas se realizaron a 22 ± 2ºC y fotoperiodo natural. Se evaluó la mortalidad a las 96 hs de exposición en agua y a 10 días en sedimento. Las CL50 (concentración letal 50%) se calcularon mediante el análisis Probit. En agua, para los individuos de menor tamaño, lambdacyalothrin resultó ser el insecticida más tóxico con un valor de LC50 de 4 ng/L; cipermetrina 34 ng/L y clorpirifos 138 ng/L. Los individuos de mayor tamaño fueron menos sensibles para cipermetrina (72 ng/L). La toxicidad en sedimento fue mayor para lambdacyalothrin: 256 ng/g, cipermetrina: 2073 ng/g y clorpirifos: 3101 ng/g. Algunas concentraciones determinadas en arroyos Pampeanos que presentan agricultura intensiva en su cuenca resultaron mayores a la CL50 calculada para H. curvispina por triplicado. En los ensayos de agua se comparó la toxicidad en organismos de distintos tamaños, con individuos tamizados entre 355-500 µm y entre 500-710 µm. En sedimento solo se utilizaron los individuos mayores. Las pruebas se realizaron a 22 ± 2ºC y fotoperiodo natural. Se evaluó la mortalidad a las 96 hs de exposición en agua y a 10 días en sedimento. Las CL50 (concentración letal 50%) se calcularon mediante el análisis Probit. Todas las pruebas se realizaron triplicadas. En los ensayos de agua se comparó la toxicidad en organismos de distintos tamaños, con individuos tamizados entre 355-500 µm y entre 500-710 µm. En sedimento solo se utilizaron los individuos mayores. Las pruebas se realizaron a 22 ± 2ºC y fotoperiodo natural. Se evaluó la mortalidad a las 96 hs de exposición en agua y a 10 días en sedimento. Las CL50 (concentración letal 50%) se calcularon mediante el análisis Probit. Todas las pruebas se realizaron triplicadas.

El consumo de plaguicidas en Argentina aumentó en forma constante durante las últimas dos décadas, siendo clorpirifos uno de los más utilizados. El objetivo de este trabajo fue determinar la toxicidad aguda de clorpirifos para Simocephalus vetulus y comparar su sensibilidad con la de otros crustáceos mediante distribución media sensibilidad por especies (SSD). Se eligió este cladópodo por su amplia distribución en áreas agrícolas regionales, su gran tamaño y elevada tasa reproductiva. Los ensayos de toxicidad se realizaron siguiendo la metodología propuesta por USEPA para Daphnia magna. Se utilizaron 6 concentraciones del pesticida y se determinó la concentración letal 50% (LC50) mediante el método Probit. Todas las pruebas se realizaron triplicadas. El 48h-LC50 y los límites de confianza al 95% obtenidos fueron 0,70(0,5-0,8) µg/L. Se observó que S. vetulus se encuentra dentro del 40% de especies más sensibles y es más sensible que Daphnia magna, el cladópodo más ampliamente utilizado. Se concluye que este organismo por su alta sensibilidad a pesticidas puede ser un organismo modelo en estudios de evaluación de riesgo ambiental.

TP079. Toxicity of chlorpyrifos, endosulfan and lambdaacyalothrin and the binary mixtures on “pejerrey” (Odontesthes bonariensis) larvae

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Chlorpyrifos (CP), endosulfan (EN) and lambdaacyalothrin (LC), are among the most used pesticides in Argentina. It was found they are able to reach freshwater ecosystems. Little is known about the toxicity of these compounds and their mixtures on local fish species. The “pejerrey” (O. bonariensis) is a valuable gamefish species characteristic of the meriodional sector of the “del Plata Basin”, a core agriculture area of South America. The aim of the present study was to assess the acute lethal effects of these pesticides and their mixture on pejerrey larvae. Four independent semi-standardized static toxicity test were conducted with all the compounds alone and in binary mixtures along the LC50 (0.16-4.64) µg/L. The 48h and 96LC50 for each active ingredient was estimated by the Probit and the TU as the ratio 1/LC50. A Concentration Addition Model (CA) was assumed and the departure from the model was tested by the Chi-quadrado test. Toxicity rank of tested active ingredients based on the LC50 was: LC50 (0.02 µg/L (0.0-0.05), EN 0.6 µg/L (0.19-1.86), and LC 1.71 µg/L (0.16-4.64). Mixture significantly (p<0.05) deviates from the CA model for LC-CL and EN-CL. The result obtained for the LC-CL mixture were: 0.61 UT, 1.17 UT and 1.28 for the 1:3, 1:1 and 3:1 proportions, respectively, changing from antagonism to synergism depending on the LC and CL proportions. The toxicities for the EN-CL mixtures were 0.28 UT, 0.43 UT and 0.63 UT for the 1:3, 1:1 and 3:1 proportions, respectively, showing the opposite effect to the CL. The magnitude of the antagonism and synergism were between 40% and 30%, respectively. Finally, toxicities for the LC-EN mixtures were controversial. Two experiments showed additivity and two showed antagonism: 0.28 UT, 0.43 UT and 0.63 UT for the tested proportions. Overall, results indicate that the toxicities of commonly used pesticides mixture is complex of predicting based just on their mechanisms of action, and experimental testing are required.

TP080. ¿Es Ramalina celastri (Hongo Líquenizado) una especie bioindicadora en áreas de agricultura?

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Los líquenes son ampliamente utilizados como bioindicadores. Algunos, como Ramalina celastri, pueden ser útiles como bioindicadores de contaminación atmosférica. Para evaluar la respuesta de esta especie a los efectos de la contaminación, se tomaron muestras de los líquenes de ramalinas de arbustos y árboles de los bosques nativos, considerados como bioindicadores de contaminación. Se observaron diferencias significativas en el crecimiento de las ramalinas de arbustos y árboles de los bosques nativos, considerados como bioindicadores de contaminación. Se observaron diferencias significativas en el crecimiento de las ramalinas de arbustos y árboles de los bosques nativos, considerados como bioindicadores de contaminación. Se observaron diferencias significativas en el crecimiento de las ramalinas de arbustos y árboles de los bosques nativos, considerados como bioindicadores de contaminación.
El endosulfán (EDS) ha sido utilizado en las últimas décadas a nivel mundial para combatir una amplia variedad de plagas. En Argentina su uso se prohibió en el año 2013 y debido a sus características físicas, químicas y ambientales, es posible detectarlo en bajas concentraciones en ecosistemas acuáticos adyacentes a zonas agrícolas. Debido a la vasta cantidad de información generada de los efectos adversos del EDS en la biota (estrés y daño oxidativo, daño al ADN, peroxidación lipídica), se ha propuesto su uso como tóxico modelo. En este sentido, el objetivo de este trabajo fue estudiar en la hidroflora Bidens laevis, especie representativa de ecosistemas lagunares pantanosos, los posibles efectos subletales del EDS, utilizando una batería de biomarcadores bioquímicos y fisiológicos. Para ello, plantullas intactas de B. laevis se expusieron a las siguientes concentraciones de EDS (mezcla isomérica α: 70% β 30%): 0; 0,02; 0,5; 5; 10; 50 y 100 µg/L durante 24 h (n=10 por tratamiento). Finalizado el tiempo de exposición a EDS, las raíces fueron colectadas para la determinación de biomarcadores enzimáticos, como las actividades de Catalasa (CAT), Guaiacol Peroxidasa (POD), Glutation-S-Transferasa citósica y mitocondrial (GSTc y GSTm) y Glutatión Reductasa (GR); y no enzimáticos como el contenido de malondialdehído (MDA), siguiendo métodos previamente estandarizados para B. laevis. Por otro lado, en hojas se analizaron biomarcadores fotosintéticos, como la fluorescencia de clorofila a (FLC) medida por la relación Fv/Fm, mediante fluorímetro y el contenido de clorofila total (CLT) por extracción química y SPAD. En el análisis de los biomarcadores enzimáticos se observó una inhibición significativa de GSTc a 0,02 y 10 µg/L EDS (p < 0,05). Asimismo, a 0,02 µg/L EDS se observó un incremento significativo en el contenido de MDA (p < 0,05), indicando una alta sensibilidad de la especie y de este tipo de biomarcadores. Por otro lado, no se observaron cambios significativos en los biomarcadores fotosintéticos. Los resultados obtenidos muestran efectos subletales en raíces y no así en hojas, debido a las características del compuesto (log KOW del EDS = 4,74 para isómero α, 4,79 para isómero β) y al bajo coeficiente de translocación previamente determinado en B. laevis (TSCF = 0,14 ml/g para la mezcla isomérica).

Environmental Fate of Pollutants

TP082. Adsorción-desorción de 2,4-d en suelos de cultivos de arroz de diferentes ambientes edáficos de un mismo lote del noreste de la provincia de corrientes


El proceso de adsorción-desorción de un herbicida en el suelo regula la potencialidad de lixiviarse. El 2,4-dichlorofenoxicácético (2,4-D) es un herbicida acido débil que se halla en estado aniónico al pH de los suelos agrícolas. El objetivo fue estudiar el proceso de adsorción-desorción en función de la variación de los constituyentes del suelo por efecto de la posición en el paisaje. Las muestras se extrajeron del NE de la Provincia de Corrientes a 0-8 cm: suelo arable (C) Arcilla 2%, Límo 4.3%, Arena 93.7%; CO 0.91%; pH 5.3; CEC 9.6 (mes=100g), Ca2+ (mol/kg) 3.7; zonas de hierbas (H) Arcilla 2%, Límo 20.9%, Arena 77.1%; CO 1.57%; pH 5.6; CEC 12.7; Ca2+ 6.5. La adsorción-desorción se caracterizó aplicando el método de Batch (OECD 1995). Las isotermas se ajustaron a la forma logarítmica de la ecuación de Freundlich (R2=0.998). En general, la magnitud de la adsorción fue baja: C (Kf 0,65 ± 0,07) > H (Kf 0,21 ± 0,08). El 2,4-D es un ácido débil con un pKa de 2,7, en un rango de pH entre 5-8 la molécula se encuentra en forma aniónica, la cual es retenida por el suelo. La desorción no es totalmente efectiva ya que queda un 30% retenido, indicando una irreversibilidad del proceso. La adsorción no se relacionó con el pH dado que al rango estudiado la molécula se halla 99% como especie aniónica. Los Ks se correlacionaron positivamente con arcilla (r=0.98, p<0,001), Ca2+ (r=0,92, p<0,01), limo (r=0,84, p<0,05). Los contenidos de estas propiedades aumentan en dirección decreciente a la pendiente del paisaje=H>C. La mayor capacidad de adsorción que tiene el C, se debe a la mayor proporción de arcilla, limo y Ca2+. La variabilidad espacial de la adsorción está regulada por la variación de los constituyentes edáficos afectados por su posición en el paisaje.

TP083. Anthropic activity history in the Estuarine System Santos and São Vicente

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The Baixada Santista is an important economic region of Sao Paulo State, strongly urbanized and populated, where environmental pressures are increasing due to the local industrialization development. As heavy metal concentrations may indicate human influences in the environment, this study aimed to reconstruct the spatial and temporal trends of pollution in Santos e São Vicente through the last decades, using the concentration of heavy metals and As from nine sliced sediment cores analyzed with ICP-OES. Santos and São Vicente estuary presented high concentrations of Cu, Pb, Zn and especially Hg, indicating contamination in this region. The concentration of metals in the study area was consistent with the local industrial growth.

TP084. Buried Horizon as record of organochlorine pesticides use in past time

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Organochlorine Pesticides (OCPs) have been widely used as insecticides for crop treatment in Argentina. Currently the use of these compounds (such as p,p’-DDT, Endosulfans, Dieldrin, Chlorodanes, HCHs, Heptachlors) have been banned worldwide, due to the long range transport capacity, high bioaccumulation properties, persistence in the environment and adverse effects to human health. Despite the legal restriction adopted for these contaminants, the residues can be found in the environment long time after the application in agricultural plots (AP) have occurred. They are usually associated with soil organic carbon content, considering the high hydrophobicity. On the other hand, in floodplains, where flow episodes are more usual, buried soils could be found. A flow episode occurred in 1980 in the proximity of Quequén River, changed the land topography of especially on the AP with large amounts of sand deposition. The objective of this work was determine pesticide levels in a buried horizon from an AP in relation to surface soil. Also, the AP contaminant levels were compared with a buffer zone near the river gully. OCPs were Soxhlet extracted and determined by GC-ECD. Results showed notable enrichment in organic carbon content (2.5%) at 80-90 cm soil layer (buried horizon) from AP which decreased with depth, while surface soil (0-10 cm) showed lower organic carbon content (1.5 %). Total OCPs maximum concentration were 6 times higher in the buried horizon (2.2 ng g-1 d.w., 90-100 cm of depth) than in surface soil (0.4 ng g-1 d.w., 0-10 cm of depth) from AP. Also, a different distribution pattern in the concentration of groups was observed with depth (buried horizon: DDTs = Endosulfans > Heptachlors = g-HCH > Die Lindrin > Chlorodane while in surface soil: Endosulfans > DDTs > Heptachlors = g-HCH > Chlorodane). The higher total
OCPs concentration in the buffer zone was 0.6 ng g-1 d.w. (0-10 cm) and concentration from 45 cm to deeper layers were below 0.1 ng g-1 d.w. The group distribution pattern for the buffer zone was similar to surface soil from AP and Endosulfans were mainly found in deeper layers. These results suggest the possible presence of a buried agricultural soil and remark the importance of buried horizons in establishing a connection between past time and pesticide uses. During the monitoring period, buried seeds and soils with different transport stage should have contributed to the presence of these contaminants in the deepest soil layer from AP.

TP085. Determinación atmosférica de plaguicidas de uso histórico y actual por resinas XAD-2 en una cuenca agrícola de la provincia de Buenos Aires.

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Los muestreros pasivos constituyen una herramienta importante para el monitoreo atmosférico de contaminantes. Los XAD-PAS, compuestos por una resina de estireno-divinilbenceno, absorben los contaminantes de la atmósfera por difusión, permitiendo obtener la concentración media en el aire integrada en el periodo de exposición. El objetivo fue determinar la concentración de pesticidas de uso pasado (plaguicidas organoclorados; POCs) y actual (PUA) en la atmósfera de la cuenca del Río Quequén Grande, Buenos Aires, Argentina. Se establecieron 10 sitios de muestreo abarcando zonas urbanas, agrícolas y agropecuarias. En cada sitio se instalaron 2 PAS y en los sitios agrícolas, se cuantificó la emisión desde el suelo colocando dos PAS adicionales a 50 cm. Se abarcaron los periodos: mayo-setiembre de 2013 y septiembre 2013-febrero 2014, correspondientes a pre-aplicación y aplicación de insecticidas. Los plaguicidas fueron extraídos por Soxhlet, purificados con silica gel y analizados por GC-EC-ToMS. El insecticida clorpirifos fue el más abundante, representando entre el 50-80% de los compuestos analizados, seguido por los endosulfanes (2-30%), trifuralina (5%), cloralotolin (1-10%) y el resto de POCs como DDTs, clorados y HCHs (1-3%). Los niveles de clorpirifos y endosulfanes se incrementaron en el período de aplicación (55.2-114.5 pg/m3 y 9.4-146.7 pg/m3, respectivamente) respecto a pre-aplicación (< LD17.16 pg/m3 y 0.13-17.0 pg/m3). Asimismo, en el periodo de aplicación, los sitios ubicados en las zonas con influencia agrícola presentaron niveles mayores de clorpirifos y endosulfanes (200-1400 pg/m3 y 13-147 pg/m3) que aquellos bajo influencia urbana (< LD17.2 pg/m3 y 0.3-17 pg/m3). No se observaron diferencias entre PAS en altura y a nivel de suelo excepto para el herbicida Trifuralina en un sitio agrícola en el período de pre-aplicación de insecticidas. Estos resultados coinciden con el uso previo a la siembra de cultivos invernales. La predominancia de los insecticidas clorpirifos y endosulfanes en todos los sitios de muestreo refleja su uso en cultivos de soja. La presencia de endosulfán en el período septiembre 2013-febrero 2014, indicaría su uso a pesar de su reciente prohibición.

TP086. Intrinsic toxicity of Myracrodruon urundeuva extracts determined with Artemia salina, Allium cepa and Eruca sativa.

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In the popular medicine Myracrodruon urundeuva extracts are used for diverse and different purposes according to the plant part used. In the northeast of Brazil, its barks and seeds are used as anti hemorrhagic, diuretic, antiseptic, anti diarrheal, wound healing and anti-inflammatory. Several problems are related to the empirical use of plants as medicines, such as absence of standardization and the real knowledge about its toxicity and intrinsic effects on individual responsiveness. The aim of this work was evaluate the acute toxicity and phytotoxicity of M. urundeuva barks and seeds extracts by using Artemia salina, Allium cepa and Eruca sativa. Aqueous extracts in concentrations of 100%, 75%, 50% and 25% were prepared by a infusion of 100mg/L. For the acute toxicity, A. salina bioassay was used. After the eggs eclosion in artificial seawater, nauplii were collected and incubated in sterile, flat-bottom 96-well polystyrene microplates containing seawater the extracts and 10 nauplii in each well. Phytotoxicity assays were performed in Petri dishes lined with filter paper were used. All assays were performed in triplicate. An inhibition rate. All assays were performed in triplicate. The A. salina bioassay revealed effects related to extract type and concentrations. Mortality corresponding to 70% and 20% were determined for barks and barks extracts at 100% and 75%, respectively. Extracts at 50% and 25% did not induce the nauplii mortality after 24 hours. In the phytotoxicity bioassays all parameters evaluated varied according to seed type, extract type and concentration. The herb extract exhibited a higher inhibition effect in all conditions compared to barks extracts. Also, A. cepa seeds were more sensitive than E. sativa to the extracts tested. An inhibition on germination rate varied between 30% and 50%. Influence on A. cepa and E. sativa plantule morphology were also observed, related to coloration and texture compared to control. This research revealed that aqueous extract of M. urundeuvaat different concentration levels has effect related to its concentration on A. salina viability and decreased all the germination parameters evaluated on A. cepa and E. sativa. These results indicate a toxicity potential which must be investigate in others toxicities systems.

TP087. Levels of Persistent Organic Pollutants and Emerging Contaminants in Latin American Atmosphere.

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The Latin American Passive Atmospheric Sampling Network (LAPAN) has been set up to enable studies of long-term spatial and temporal trends of atmospheric contaminants on a regional scale. Persistent organic pollutants (POPs) and current used pesticides (CUPs) are considered. The network employs passive samplers constituted by a stainless steel mesh cylinder filled with XAD-2 (stereopolydivinylbenzene - copolymer resin). The passive atmospheric samplers have been deployed within Latin American countries since 2010. So far, the network runs 73 sites, covering areas with different backgrounds (low-impact (remote), urban, industrial and rural) including Argentina, Bolivia, Brazil, Colombia, Chile, Ecuador, Peru, Uruguay, Venezuela and Honduras. Moreover, sites from Antarctica were included. Thirty-nine PCBs congeners, twenty-seven organochlorine pesticides (DDTs, endosulfans, chlordanes, drins, methoxychlor, heptachlors, HCHs, mirex and HCb), and three CUPs (dichlofluanid, chlorothalonil and trifluralin) were quantified using a GC Perkin Elmer Clarias 500 gas chromatograph equipped with a 63Ni electron capture detector (ECD) and GC/MS Perkin Elmer Clarias 680 SQ-5T. Contaminant levels were always higher at urban and rural than low-impacted sites. Bahia Blanca (Argentina) showed the highest levels of DDTs, endosulfans, PCBs and PBDEs while Puerto Maldonado (Peru) presented the highest chlordane levels. Endosulfans (≤ DL - 45 pg m-3) and E2DDT (≤ DL - 2104 pg m-3) presented the highest levels in urban and agricultural areas. PCBs were present in all sites with concentrations ranging from 3 to 29.1 pg m-3. Agricultural and urban areas showed the highest PCB levels (29.1 pg m-3). Although PBDEs levels were low (≤ 2 pg m-3).
In Brazil, the insecticide malathion is indicated for use in public health activities to control Aedes aegypti. The mosquitoes' control involves different activities, including the application of insecticides to reduce the number of larvae and adult mosquitoes. In the field the application of malathion TG 96% diluted in vegetable oil (1:2 v/v) is done by nebulization. For the application of malathion, applicators should wear personal protective equipment (PPE), which is washed after the use. The oxidation of malathion may result in malaoxon, a more toxic product than the malathion. The objective of this study was to monitor the washing water used to clean PPE in the dengue's control. Water (200 mL) was extracted with 10 mL of dichloromethane (2 times) and 20 g of NaCl in a separated funnel. The organic layer was collected under Na2SO4 and concentrated using a vacuum rotary evaporator below 40°C until 10 mL. Malathion and malaoxon were quantified by gas chromatography with FID detector. From the 34 samples analyzed, 29.4% was contaminated with malathion in concentrations ranging from 0.27 to 166.3 mg.L-1. From this total, 5 samples (14.7%) were contaminated with malathion at concentrations from to 0.52 to 134.3 mg.L-1. Although there are no set parameters of pesticides in the sewage system, an evaluation of acceptability for this kind of effluent is necessary, because the treatment system should be able to remove these pollutants in order not to reach streams and rivers.

**TP091. Occurrence of organochloride pesticides (OCPs) in the Chilean atmosphere using PUF disk passive air samplers**

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Organochlorine insecticides are among the oldest, most toxic, and most environmentally destructive synthetic pesticides. They target the central nervous system, and many of them are suspected to cause cancer. Some of them belongs to the groups of Persistent organic pollutants (POPs) and are regulated under the Stockholm convention (SC). Very little is known regarding the use and levels of pesticides in Chilean environments in agricultural regions. This information is needed to assess deposition/ emission, human exposure and best strategies for minimizing the risks to humans and the environment. In this study we assess the occurrence of OCPs in Santiago, Concepcion and Temuco city, using PUF disk as passive air samplers. PUF disk were deployed at six sites at each city for approximately three months integration periods. PUF disk samples were analyzed using gas chromatography – mass spectrometry (GC-MS). Results showed that at Temuco and Santiago, OCP levels were similar ranging from 1-15 for ΣDDTs and 1-20 for ΣHCHs. However, in Concepcion, OCPs were slightly higher than those detected in Temuco fluctuating between ~2-25 ΣHCHs and ~2-40 for ΣDDTs. In general the most abundant individual compounds were pp’-DDE accounting for ~90 % of total DDTs and γ-HCH with ~80% of total HCHs. The study showed that there is a prevalence of γ-HCH suggesting no usage of technical HCHs in the country. These levels are similar than those reported in other studies around the world using PUF disk passive air samplers. These results constitute one of the few measurements of organochloride pesticides in the Chilean atmosphere. Future research is need in order to cover agricultural regions that may enhance the drift of pesticides into urban areas. Acknowledgment This study thanks the support of Fondecyt N°1130329. The authors also thank the RECETOX research infrastructure supported by the projects of the Chilean Ministry of Education (LO1214) and (LM2011028).

**TP092. Persistent Organic Pollutants (POPs) in soils of Bahía Blanca city and region (Argentina)**

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Persistent organic pollutants (POPs) such as organochlorine pesticides and polychlorinated biphenyls (PCBs) are listed under Stockholm Convention. In this study four soils samples were analyzed for HCHs (α-, β-, γ-, and δ-), DDTs (pp’-DDE, p,p’-DDE, p,p’-DDP), hexachlorobenzene (HCB), pentachlorobenzene (PCB3) and seven indicator (PCBs) congeners (PCB-28, -52, -101, -118, -153, -
138, and -180). Sampling sites were located two in Bahía Blanca city and two sites located to the west and south (about 40 km and 80 km respectively). In all samples PecB was below detection limit (< LOD) and HCB ranged from ~14 to 35 pg/g dry weight (d.w.). ΣDHCs (pg/g d.w.) ranged from ~86 to 360, with the highest levels corresponding to the samples obtained in Bahía Blanca city. γ-HCH was found in all samples and showed the highest HCH contribution (46% to 84%), which can be associated with the use of Lindane (consists almost entirely of γ-HCH). ΣDDTs (pg/g d.w.) showed the highest levels of all pesticides studied, with concentrations ranging from ~100 to 2000, and with DDT/DDE ratio of ~1,7 and 1,1 for the samples obtained in Bahía Blanca city (ratio often used to distinguish probable recent use when DDT/DDE >1). The pattern of OCs distribution (DDT and metabolites > HCHs) was similar to the observed in agricultural soils from southeastern region of Argentina (Arias et al., 2011). ΣPCBs (pg/g d.w.) ranged from ~250 to 1700. Bahía Blanca samples (~1400 +/- 350) duplicate the others (~400 +/- 200). Although the substances are banned in the country, these results showed that they are still in the environment. Thus, the present study contribute with new data about the current status of this region located in the southeast of Buenos Aires Province (Argentina) respect to POPs, and show the importance and need of monitoring programs. Acknowledgments This investigation was supported by Universidad Nacional del Sur, PGI MayDS project (N.Tombesi). The authors thanks to Fondenct 1130329 project (K.Pozo). This project was supported by the National Sustainability Programme of the Czech Ministry of Education, Youth and Sports (LO1214) and the RECTOX research infrastructure (LM2011028). References: Stockholm Convention, 2011 http://chm.pops.int/ Arias et al. (2011) In: Pesticides-Formulations, Effects, Fate (INTECH), p 313 - 332

TP093. Persistent organic pollutants at low concentrations in crabs and fishes from the Marajo Island, an Amazonian ecosystem
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Marajo Island is located in the Brazilian Amazon River delta and is considered the largest fluvial-marine archipelago in the world. Its economy is underpinned by activities of the primary sector, particularly buffalo livestock, fishery and animal and vegetal extractivism. The island is susceptible to the occurrence of malaria and DDT was used to control the disease until 2009. We investigate the levels of DDT, its metabolites and other persistent organic pollutants (PCBs) in crabs and fishes of economical relevance from the Marajo Island. Oicles cordatus cordatus, a semiterrestrial mangrove crab, feeds on epiphytic green and brown algae, litter, roots and sediments. The catfish Scardies proops is found in brackish estuaries on shallow muddy-sandy bottoms, feeding on small fishes and crustaceans. Eleven adults of U. cordatus with 7.4±0.34 cm mean carapace width, and six of S. proops with 52.2±2.3 cm length, were purchased from a central supermarket of the Marajo city. In laboratory, samples were measured and stored. Surfactants extracts from aquatic organisms were used for the electron capture detector in gas chromatography. Internal standards were used for quantitation. Total PCBs were found in all crab tissues, from 0.14 to 41.1 ng/g - 1. DDT metabolites, pp’-DDE + pp’-DDD, were observed in crab tissues from 0.39 to 15.3 ng/g-1, and presented positive linear correlation with total lipids. In fishes, total PCBs concentrations were up to 35.3 ng/g-1 and pp’-DDE + pp’-DDD concentrations varied from 0.15 to 15.5 ng/g-1. Liver tissues also presented contribution from op’-DDE. Total PCBs correlated positively with pp’-DDE + pp’-DDD for fishes. For both organisms, PCBs accumulation trend appears to be in the following sequence: gills > liver/hepatopancreas > muscles; whereas for DDT metabolites, liver/hepatopancreas > gills > muscles. Overall, the organochlorine contaminants concentrations in the organisms were low, compared to other Amazonian coastal areas, and within the acceptable threshold for consumption according to international quality guidelines. Further investigation is needed with other species to evaluate the distribution trend of persistent organochlorine contaminants in this ecosystem.

TP094. Polybrominated Diphenyl Ethers (PBDEs) in sediments of Bahia Blanca estuary (Argentina)
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Polybrominated Diphenyl Ethers (PBDEs) are one type of brominated organic compounds commonly used as flame retardants in a number of applications, including textiles, plastics, wire insulation, and automobiles. Due to their toxicity and persistence, the industrial production of some PBDEs (penta and octabromodiphenyl ethers formulations) is restricted under the Stockholm Convention (Stockholm Convention, 2011). The study of trace organic contaminants in coastal marine environments and especially in estuarine systems is of great importance since these areas are biologically productive and receive considerable pollutant inputs from land-based sources via river runoff and sewage outfalls. The Bahia Blanca Estuary System constitutes an ecosystem unique in the world by its physical, geographic and biological characteristics. Surface sediments (four stations) from the north shoreline (the more anthropized coast) of Bahia Blanca estuary were analyzed for 10 PBDEs de-kjeldahl at the following levels (pg/g dw): PBDE 28, 47, 66, 99, 100, 105, 184, 185, 138, and 137. PBDEs analyses were performed by gas chromatography–mass spectrometry. Results showed that all congeners analyzed PBDE 28, 47, 99, 100 and 209 were the detected. 2PBDE28,47,99,100 range from Acknowledgments This investigation was supported by Universidad Nacional del Sur, PGI MayDS project (N. Tombesi). The authors thanks to Fondenct 1130329 project (K. Pozo). This project was also supported by the National Sustainability Programme of the Czech Ministry of Education, Youth and Sports (LO1214) and the RECTOX research infrastructure (LM2011028). References: Stockholm Convention (2011) http://chm.pops.int/ Pozo et al. (2015). Marine Pollution Bulletin 95, 480-483

TP095. Soils sorption of surfactants from agricultural pesticides: the case of nonylphenol
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The region productiva pampense de Argentina está mayoritariamente dedicada a cultivos hortícolas, en seco, siendo cultivados más de 5 millones de kg/m2 de diferentes formulados de plaguicidas. A éstos se asocia el ingreso a los ecosistemas de unos 15.750.000 kg/año de coadyuvantes surfactantes, de los cuales el nonilfenol se considera como modelo. El objetivo del presente trabajo es estudiar el comportamiento de tres tipos de surfactantes característicos de agroecosistemas de zonas productivas locales en el fenómeno de sorción de nonilfenol. Asimismo se evalúa la influencia de diversas características y parámetros medidos de los sustratos en dichos procesos. Se obtuvieron isometas de sorción de nonilfenol sobre tres tipos de suelos provenientes de Arrecifes y Balcarce (Buenos Aires) y Hersilia (Santa Fe). Con ello, se definió un comportamiento de los mismos, obteniendo: 1.5 g y 8 h para los suelos de Arrecifes, 1 g y 8 h para el de Balcarce. Se determinó el contenido de nonilfenol en fase acuosa por HPLC-MS, con columna C-18 en condición isocrática de NHAc 5 m/Methanol, con detección en un cuadruplo simple con fuente de ionización APCl, monitorizando selectivamente tanto los tiempos m/z=219 y m/z=133 (modo SIM) en ionización negativa. La determinación fue realizada en un sistema de calibración lineal y con el uso de un método de calibración externa. Los resultados obtenidos muestran la importancia de estudiar la interacción de compuestos representativos de formulaciones de plaguicidas para alcanzar un mejor conocimiento de las posibles aplicaciones en el ambiente.

TP096. Use of the índice PIRI para estimar el potencial de lixiviación de glifosato y metsulfuron-metil en la Cuenca del Salado
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El objetivo del trabajo fue estimar el potencial de lixiviación de los herbicidas Metsulfuron metil (MET) y Glifosato (GLY) en la Cuenca del Salado a través del...
Environmental Health

TP097. Carboxyl emissions from a Euro 5 diesel engine fueled with recycled cooking oil biodiesel blends

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The use of biodiesel is promoted as a cleaner alternative because they reduce the levels of criteria pollutants such as particulate matter and some gaseous emissions. However, this can be variable depending on biodiesel feedstock, regarding some non-criteria pollutants like volatile organic compounds, especially carbonyls, for their potential mutagenic properties. The objective of the present work is to evaluate carboxyl emissions from biodiesel combustion from a EURO5 diesel vehicle (Mitsubishi Katana, 2014) placed on a chassis dynamometer under the European driving cycle (EUDC) and coupled to a dilution tunnel. Biodiesel was made from recycled cooking oils and its diesel blends (B0, B5, B20 and B80) were tested. Carboxyl emissions were collected in 2.4-dinitrophenylhydrazine (DNPH) cartridges with subsequent extraction with acetonitrile and HPLC/UV-Vis. A calibration curve was made based on a mix of 13 derivatized carbonyls standards (formaldehyde, acetaldehyde, acrolein, acetone, propionaldehyde, crotonaldehyde, methacrolein, n-butylaldehyde, 2-butanone, benzaldehyde, valeraldehyde, tolualdehyde, hexanal). The quantification limits were 0.10–1.0 µg·mL⁻¹ with linearity between 5 and 160 µg·L⁻¹. The carboxyl Emissions of formaldehyde showed a significant increase as the amount of biodiesel increased in the mix. With diesel (B0) formaldehyde emissions were 3.77 mg·m⁻³, which had no differences with B5. However at B20, formaldehyde emissions increased to 5.90 mg·m⁻³ and at B80 reached 17.08 mg·m⁻³. Acetone and acrolein were quantified together due to difficulties in resolving its chromatographic peaks. These compounds showed a decrease in emissions as the blend percentage increased, however due the high standard deviation it was not possible to establish significant differences.

Emissions of acetaldehyde, propionaldehyde, crotonaldehyde and 2-butanone were very low, so it was not possible to determine differences between biodiesel blends. The rest of the carbonyls were not detected. These results indicated that formaldehyde increased with the use of biodiesel of recycled oils rising the amount of mutagenic compounds in the atmosphere even with more advanced vehicle technologies like EURO5. Authors thank to FONDEF Project D09I-1070, Becas Doctorado Conicyt 2014 and CONICYT-FONDECYT/Postdoctorado 3150685 for their financial support.1 EPA USA. 202. A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions.

TP097. Genotoxicity of urban area from southern BRAZIL: mutagenicity of inhalable particles and DNA damage in children

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Investigation of environmental quality using biomarkers of genotoxicity contributes to the identification of areas with potential health risks to exposed populations. This study aimed to analyze comparative genotoxicity data of DNA damages in lymphocytes of children and airborne inhalable particles (PM2.5) from Rio Grande city (RS), southern Brazil. PM2.5 were collected with high volume samplers at two different areas of the city, one at an urban industrial (Site 1) and the other at an urban-residential area (Site 2). The samples were collected once a week (24h) during winter (August/09, July/10, August/10) and Autumn (April/10, May/10). Filters were pooled by month and submitted to organic extraction by sonication. The mutagenicity of organic extracts was assessed by Salmonella/microsome assay, microsuspension method, using strain TA98 with and without mammalian liver metabolism (S9 mix). Children between 5 and 12 years old living and studying in this two sites were evaluated for primary DNA damage in peripheral blood lymphocytes using comet assay during the same periods. The concentrations of PM2.5 were similar among the sites and ranged from 1.28 to 35.05 µg·m⁻³. The highest particles concentrations occurred in the winter when two filters (Site 1: 32.67; Site 2: 35.05 µg·m⁻³) surpassed the PM2.5 limit of 25 µg·m⁻³ recommended by the World Health Organization. All PM2.5 organic extracts were positive for mutagenicity, ranging from 0.99 to 17.08 rev/µg (Site 1) and from 1.77 to 9.70 rev/µg (Site 2). Generally, mutagenicity was higher after non-metabolization, indicating the predominance of direct action. The primary damage marker in the DNA (tail intensity) in children living in the two areas showed significantly increased to Site 2 group (8.05%; n=41) compared to Site 1 group (5.91%; n=37). The tail intensity mean for all subjects was 7.03%, similar to a study that evaluated children at the same age from an area of reference for mutagenicity that investigate genotoxic air contaminants in the same state at southern Brazil. The mutagenicity of PM2.5 samples indicates that the value established for air quality is insufficient to avoid environmental damages. It is necessary to advance in the parameters that could estimate genotoxic effects in children exposed to environmental pollutants. Financial support from CNPq (573993/2008-4 and 555187/2006-3) and CAPES (MV Coronas and AT Lemos fellowships).

TP099. The gañadería intensiva como contumazante de cursos de agua en la provincia de Buenos Aires

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ción expuesta a los residuos de un feedlot ubicado en la localidad de Santa Lucía, San Pedro, provincia de Buenos Aires (33° 54’13.65”S/ 59° 50’12.15”W). Los líquidos residuales de dicho feedlot se vierten mediante en un sistema de vaguadas naturales que lo conecta al cauce principal del Arroyo Burgos. Se estudió la contaminación microbiana de los líquidos residuales en dos sitios de muestreo: salida del feedlot (Punto 1) y en una vaguada donde se practica ganadería extensiva, ubicada a 5.45 km de distancia del Punto 1 (Punto 2). Las muestras se tomaron durante los años 2012, 2013 y 2014 y se determinó la presencia de Escherichia coli, y de enterococos considerados como indicadores de contaminación fecal y de Salmonella spp como enteropatogénicos. Con los datos obtenidos, se calculó el riesgo de infección por Salmonella spp utilizando la metodología del análisis cuantitativo de riesgo microbiológico (ACRM), para la población expuesta especialmente para los trabajadores agropecuarios que tienen contacto directo con el agua. En el punto 1 se obtuvieron valores medios de E. coli 1,3 x 104 UFC/100mL y 5,7 x 103 UFC/100 mL de enterococos. Se detectaron mediante el Número más Probable (NMP) valores medios de Salmonella spp de 1,03/100 mL. En el punto 2 los valores medios fueron para E. coli 1,4 x 103 UFC/100mL, y 1,8 x 102 UFC / 100 mL de enterococos y para Salmonella spp de 0,70/100 mL. En el punto 1, el riesgo de infección con Salmonella spp se estima en un rango desde 2,0 a 4,0 x 10⁻3 y en el punto 2 el riesgo de infección anual varió de 3,5 x 10⁻3. El tránsito de los líquidos residuales por las vaguadas no contribuye a una disminución importante de la contaminación fecal presumiblemente por aportes de otras fuentes. El riesgo de contraer infecciones por Salmonella para trabajadores agrícolas en la zona de vaguadas es similar en ambos puntos de muestreo y superior a lo aceptable por las normas internacionales.
TP100. Mutagenicity and polycyclic aromatic hydrocarbons (PAH) of airborne fine particles (PM2.5) in area influenced by contaminated soil from wood treatment

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Wood preservation activities and related compounds are a problem in many areas, since they have major environmental contamination liabilities that compromise the health of the surrounding population and the integrity of ecological processes. PM2.5 samples were evaluated for mutagenicity and PAHs concentration as markers of environmental pollution in the surroundings of an area contaminated by wood treatment plant. The study area is located in the municipality of Trindade (RS-Brazil). The soil is contaminated from the past activities of a WTP that used a variety of substances including creosote, pentachlorophenol and chromated copper arsenate. High-volume collector for PM2.5 was placed in two sampler areas, one near the deactivated plant (risk) and another 1.75 km away and out of the preferential winds quadrant (reference). Filters were submitted to sonication using dichloromethane. Sixteen prioritized polycyclic aromatic hydrocarbons (PAHs) were quantified by GC-MS. PM2.5 extracts were investigated for mutagenicity in Salmonella/microsome assay. Strains that detect frameshift error (TA98, YG1021 and YG1024) were used in absence and e presence (+S9) of metabolism system of mammals in vitro. The highest mutagenic activity detected was 24±2 (-S9) and 11.84 (+S9) revertantes/m3 of sampled air in the risk area. Negative results were observed in the presence of S9, most of them in samples from reference area. The mutagenicity decreased in the presence of S9 for most of the samples. The YG1021 strain was more sensitive to detect nitroderivative compounds than YG1024. Generally, the PAHs content was higher in the risk area. Benzo[b]fluoranthene, Indeno(1,2,3-cd)pyrene, Benzo[a]pyrene and Benzo[b]pyrene showed the higher concentrations than the others PAHs in the two areas. The mutagenicity and PAHs concentrations were similar to studies that evaluated intensely occupied urban areas and under industrial influence. The results showed the presence of carcinogenic and mutagenic organic pollutants in the adjacent area of the wood treatment plant, indicating risk of exposure to substances potentially harmful to health. An analysis that identifies the presence of substances in the environment and the biological effect of the mixture allows a more appropriate approach to environmental diagnosis and monitoring. Financial support from CNPq (573993/2008-4 and 555187/2006-3) and CAFES (MV Coronas - Doctoral fellowship).

Ecological Risk Assessment

TP101. Arsenic speciation in rice and risk assessment: variation of inorganic arsenic content in Brazilian brown rice from the State of Rio Grande do Sul


Rice (Oryza Sativa L.) is one of the most important commodity agriculture reaching a production of 750 million of tons in 2014 worldwide; also its nutritional value make rice a base for many kinds of foods like biscuits and pastas among others. In another hand, it is known for more than 15 years that rice has arsenic high concentration compared to other foodstuffs [1], and arsenic is one of the ten chemicals of major public health concern according to the World Health Organization [2] due its effects such as skin lesions, peripheral neuropathy, diabetes, cardiovascular diseases, and cancer. Inorganic arsenic species (iAs = As3+ and As5+) are the most toxic arsenic species for humans. Further, determination of total arsenic concentration in rice is not enough for risk evaluation and currently the authorities are discussing Provissional Tolerable Weekly Intake (PTWI) assuming the most toxic species, iAs. This work evaluated Brazilian brown rice cultivars-specific (Purí and IRGA 424) in 67 samples from the State of Rio Grande do Sul, in terms of total and arsenic species. The highest value for iAs was 124.3±15.9 ng g⁻¹ and the lowest one was 7.1±2.2 ng g⁻¹. Results show that iAs varies according to the cultivars well as the localization of the crop, iAs in Purí was in general terms lower than in IRGA 424. References [1] Schoof, R. A.; Yost, L. J.; Eckhoff, J.; Crecelius, E. A.; Cragin, D.W.; Meacher, D. M.; Menzel, D. B. Food Chem, Toxicol. 1999,37, 839 [2] http://www.who.int/ ipc/assessment/public_health/chemicals_phc/en/

TP102. Ecological Risk Assessment of a contaminated mining area in Adrianópolis, PR, Brazil

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As many cities located in the region of Ribeira Valley in the state of Paraná, Brazil, the city of Adrianópolis had been known for its intense mining activities, started by the Plumbum Company in 1945 and lasted for 50 years. Previous researches have demonstrated that the mining activities have brought on serious environmental and human health problems in the region, due to toxic elements that were launched directly to the Ribeira de Igapó River until 1990 and the concentrated particulate material of the refining process, to the atmosphere. It is also reported that the mining wastes were used as material to pavement of roads. Due to those actions, the environmental and health problems still persist in the city nowadays. None of the previous studies, however, were focused on Ecological Risk Assessment (ERA), which consists in a complex process of collection, organization and analysis of environmental data that aim to assess the contamination risk existent in the ecosystem, performing to indentify and quantify environment risks, also to establish priorities and provide scientific data bases to lead the regulatory actions. The present study aimed to apply the ERA as contribution to the future decisions related to the region, with the purpose to transport some mitigation actions for contamination effects and contribute to the restoration processes and with the recuperation of contaminated sites as well. For these proposals, the chemical and ecological evidence guide lines were analyzed, despite the fact that the mining activities had been stopped years ago. Furthermore, the ERA proved to be an efficient tool to make it possible to comprehend different elements, that can be isolated or by the integration of its calculated risk values. This propriety allows to evaluate the analysis of the existing contamination in a holistic way and also to obtain concrete results related to contamination level of a studied site, what make it possible to direct the future use and possible activities to environmental recovery of contaminated sites.

TP103. Global assessment of bisphenol A in the environment: a review of sources, fate and bioaccumulation

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Bisphenol A (BPA) is classified as a high production volume chemical, and thus ubiquitous in the environment. We examined over 500 peer-reviewed studies to understand its global distribution in effluent discharges, surface waters, sewage sludge, biosolids, sediments, soils, air, wildlife and humans. BPA was mostly only measured in three regions of the world, namely Asia, Europe, and North America; unfortunately, information was lacking from large geographic areas, megacities and developing countries. When sufficient data was available, probabilistic hazard assessments were performed to understand global environmental quality concerns. Using maximum reported values, we found that exceedences of Canadian Predicted No Effect Concentrations for aquatic life were >50% for effluents in Asia, Europe and North America, but as high as 80% for surface water from Asia. Similarly, maximum concentrations of BPA in sediments from Asia were higher than Europe. BPA concentrations in wildlife, mostly for fish, ranged from 0.2 to 3000 ng/g. In humans (urine concentrations), using median values we observed 60% and 40% exceedences of the U.S. Centers for Disease Control and Prevention’s National Health and Nutrition Examination Survey in Europe and Asia, respectively. These findings highlight the utility of coordinating global sensing of environmental contaminants efforts through integration of environmental monitoring and specimen banking to identify regions for implementation of more robust environmental assessment and management programs.

TP104. Potencial impacto de plaguicidas sobre invertebrados acuáticos de aguas superficiales asociadas a la actividad agrícola de la región pampeana (Arg)

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El uso intensivo del suelo para actividad agrícola de la región pampeana implica, en la mayoría de los casos, un modelo productivo dependiente del uso de xenobióticos específicamente diseñados para controlar los organismos considerados no deseados desde el punto de vista productivo. Es de interés conocer el impacto que ocasionan sobre los organismos acuáticos no blancos los plaguicidas utilizados con mayor frecuencia en la región. Con este fin, se llevaron a cabo monitoreos de cuerpos de agua superficiales en la región norte de la provincia de Buenos Aires (Salto- Arrecifes-Pergamino) y en el cinturón floricórtico del Gran Plata. En función de la cantidad y frecuencia de uso se seleccionaron cuatro plaguicidas para evaluar: dos herbicidas (glifosato y atrazina) y dos insecticidas (cloprofos y endosulfán). Para cada uno de estos plaguicidas se generaron las curvas de Distribución de Sensibilidad de Especies (SSD= Species Sensitivity Distributions). Para generarlas se utilizaron valores de LC50 para invertebrados de agua dulce en exposiciones menores a 96 h a partir de la base de datos de la USEPA. Para cada distribución se calculó la Concentración de Peligro para el 5% de las especies (HC5 =Hazardous Concentration) y se comparó su valor con las concentraciones máximas encontradas en la zona de estudio. Los resultados muestran que las concentraciones máximas de cloprofos, endosulfán y atrazina fueron mayores a las HC5 estimadas, poniendo en evidencia que existe un potencial riesgo para los organismos evaluados en función de estos tres plaguicidas. En el caso del glifosato los valores máximos encontrados en aguas superficiales no superaron la HC5 estimada para los invertebrados acuáticos. Se procedió a futuro realizar una evaluación de riesgo probabilística y evaluar escenarios de efectos teniendo en cuenta las mezclas de aquellos plaguicidas que se presentan asociados en los monitoreos de la región. Agradecimiento: PICT 2010-0891 y PICT 2013-2393

Environmental Technologies (green energies and remediation)

TP105. ados de raíces de Brassica nigra, en la degradación de Antraceno y Fenantereno por un microorganismo rizósferico
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Los hidrocarburos aromáticos poliíclicos (HAPs) son contaminantes orgánicos persistentes derivados de actividades industriales. Su toxicidad los convierte en un problema para la salud humana y los ecosistemas. La rizomediación es una estrategia promisoria en la recuperación de suelos contaminados, se ha demostrado que los metabolitos secundarios de las plantas pueden inducir la degradación de HAPs en microorganismos rizósfericos. Objetivo: Evaluar el efecto de metabolitos secundarios en exudados de raíces de Brassica nigra en la degradación de HAPs en microorganismos rizósfericos. Metodología: Se aislaron microorganismos degradadores de HAPs por la técnica de enriquecimiento, del suelo rizósferico de Brasica sp cultivada en suelo contaminado con HAPs. Se evaluaron características PGPR de los microorganismos degradadores y se identificaron por secuenciación del gen 16S rRNA. Se identificaron los metabolitos secundarios presentes en los exudados de las raíces de las plantas por UHPLC y se evaluó su efecto en la biodegradación de Antraceno (50mg/L) y Fenantereno (50mg/L) por los microorganismos. El análisis de la concentración de HAPs se hizo mediante HPLC. Resultados: Del total de microorganismos aislados, se escogió la cepa denominada M2,7 que tuvo mayores porcentajes de degradación en la zona de estudio. Los resultados indican características como PGPR. En el análisis de los metabolitos secundarios de las plantas, se identificaron 6 flavonoides, estos mostraron inducción de la producción enzimática. Se caracteriza una futura metabolitoquímica para effects teniendo en cuenta las mezclas de aquellos plaguicidas que se presentan asociados en los monitoreos de la región. Agradecimiento: PICT 2010-0891 y PICT 2013-2393

TP106. Bacterial resistance to heavy metals in Río de La Plata, Argentina
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Pollution of the aquatic environment by heavy metals is a consequence of the release of industrial, agricultural and urban effluents. The presence of these metals in surface water streams leads to the selection of bacterial communities that are resistant to heavy metals. Some of these native microorganisms have also detoxification mechanisms to survive in the polluted environment such as biosorption and biotransformation. Both mechanisms constitute innovative biotechnological tools for the treatment of liquid effluents and the remediation of polluted sites. The objectives of this investigation were: a) to evaluate the bacterial resistance to chromium, cadmium, lead, zinc and copper in water samples from Río de La Plata; b) to isolate the most resistant bacterial strains and c) to study the ability of the isolates to remove the metals. Six sampling points in the coastal zone of the river were selected. Bacterial resistance to heavy metals was evaluated by determining the Minimal Inhibitory Concentration (MIC) which is the minimal metal concentration that produces inhibition of bacterial growth. This assay was performed in tubes with 10 mL of nutrient broth added with metal concentrations from 4 to 1000 mg L⁻¹. The most resistant strains were then isolated and the ability of the isolates to remove the metals was studied. Removal experiments were carried out in Erlenmeyer flasks with 100 mL of nutrient broth supplemented with 25 mg L⁻¹ of metal. The flasks were incubated during 7 days in a rotatory shaker (200 rpm) at 28 °C. The concentration of Cr (VI) and Cd in Cr and Pb were determined by atomic absorption respectively, and the concentration of cadmium, lead, zinc and copper by a modified dithizone method. In the six sampling points the MIC values were: 1000 mg L⁻¹ for Cr and Pb, 250 to 500 mg L⁻¹ for Cd and 500 to 1000 mg L⁻¹ for Cu and Zn. These results demonstrated a high level of bacterial resistance to these heavy metals in Río dela Plata. Among all the isolates, the Cr-resistant strains were able to transform Cr (VI) to Cr (III), the less mobile specie of chromium. One strain resistant to Pb was able to remove this metal from the culture medium. The removal capacity of these strains could be further studied and exploited in bioremediation processes.

TP107. Bioprospección de hongos de hojarasca con capacidad para degradar monofenol polietoxilato (NPnEO)
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Los polietoxilatos de monofenol (NPnEO) son surfactantes no iónicos con aplicación en diversas industrias, en agricultura y con fines domésticos. Su desecho directo en el ambiente o luego del tratamiento de efluente conlleva productos de degradación primaria con un fuerte impacto ambiental por su toxicidad y persistencia, que los ubica en el grupo de los denominados disruptores endócrinos. Los hongos son organismos capaces de degradar compuestos orgánicos naturales debido a la producción de variedad de enzimas. Dentro de ellos, los de pudrición blanca (WBF) y los degradadores de hojarasca (LDF) pueden degradar polímeros complejos y resistentes al ataque microbiano como la lignina. La inespecificidad de las ligninas hace posible que sean a su vez capaces de atacar otro tipo de compuestos estructuralmente similares a muchos xenobióticos. Así, estos organismos resultan intereses en su potencial utilización en bioremediación. Si bien el estudio de los WBF se encuentra muy difundido, no sucede lo mismo con los LDF. En este trabajo se propone estudiar la capacidad de aislamientos de hongos LDF en degradar la variable más utilizada de este surfactante, el NPnEO con 10 etoxilatos en promedio (NP10EO). Para ello se realizó un relevamiento de hongos LDF y se obtienen los aislamientos a partir de los basidiosomas colectados. Se caracteriza el potencial de estos hongos en producir enzimas lignocelulolíticas (ligninas, hemcelulas y celulas), mediante ensayos cualitativos y cuantitativos en cultivos agarizados. Luego, se realiza una selección de los hongos capaces de crecer en cultivos con NP10EO g/l como única fuente de carbono. Además, se estuda si existe una asociación lineal entre las velocidades de crecimiento de las cepas que crecieron satisfactoriamente en NP10EO y la producción enzimática. De los hongos seleccionados se extrajeron las curvas de toxicidad a distintas concentraciones del surfactante con el fin de determinar la concentración efectiva 50 (CE50) y resistencia al NP10EO. Al
TP109. Caracterización fisicoquímica y biológica de efluentes industriales y eficiencia en la cinética de remoción de cromo (Cr) por microalgas


En el presente trabajo se realizó una caracterización fisicoquímica y biológica de un efluente con Cr y se evaluó la eficiencia de remediación al incorporar a Chlorella vulgaris a la etapa biológica del tratamiento. Para el análisis cualitativo de la composición biológica se filtraron 10 L del efluente proveniente de la entrada y salida al reactor biológico (30 μm), se empleó microscopio óptico y claves taxonómicas específicas. Los datos fisicoquímicos fueron aportados por el personal de la planta de tratamiento. El efluente caracterizado se empleó para evaluar la cinética de remoción de Cr por C. vulgaris en Foto-Bio-Reactores (FBRs). Las microalgas fueron cosechadas en fase de crecimiento exponencial, centrifugadas y resuspendidas en agua destilada ultrapura estéril. Para cada ensayo se empleó 1 L de efluente con 1,93 (±0,08) mgL⁻¹ de Cr, un control -FBRs (efluente sin microalgas) y un tratamiento -FBRs (efluente con microalgas: 707333 cél.mL⁻¹). Se registró: pH, T°C, O₂ disuelto, agitación e iluminación. A las 6, 10, 24, 30 y 36 h se tomaron muestras de 50 ml, se centrifugaron separando el efluente del pellet (con microalgas). Ambas matrices fueron digeridas y analizadas por espectrofotometría de absorción atómica. Se calculó el % de remoción y se correlacionaron las concentraciones Cr acumuladas y las remanentes en el sobrenadante. Se aplicó t-Student para comparar los % de acumulación en pellet del control y el tratamiento. En el efluente de entrada al reactor se registró: Scenedesmus, Coixanmor, Cieolastrum y Euastrum, Hyfomyocytes, Epsistilis, algas filamentosas, nemáctides, tecambebas y pequeños flagelados. El de salida: Scenedesmus, Pediastrum, Gyrosigma, bacterias esporoquetas, ciliados de vida libre y pedunculados. Los % de remoción del tratamiento con algas fueron 59.22 %, 60.96 %, 62.79 %, 63.36 % y 60.69 % a las 6, 10, 24, 30 y 36 h respectivamente, obteniendo diferencias significativas entre controles y tratamientos (p=0,01). Se registraron correlaciones negativas significativas entre la concentración final de Cr en pellet y sobrenadante (r = 0,95; p =0,01), lo cual confirma el potencial de C. vulgaris como acumulador de Cr en efluentes industriales.

TP111. Chromium, nickel, lead and zinc accumulation and performance in relation to their use in phytoremediation of macrophyte Limnium laevigatum

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El contaminacion de carbonizada de limos es un problema serio en todo el mundo, y los metales pesados son uno de los contaminantes más comunes. En los últimos años, la remoción de metales pesados de aguas residuales mediante plantas acuáticas ha sido objeto de estudio. En este trabajo, se evaluó la acumulación de crómulo, níquel, plomo y cinc en el alga L. laevigatum para evaluar su potencial como planta de limpieza de aguas residuales.

En el experimento, se plantaron L. laevigatum en un reactor FBR (flujo de remoción de cromo) y se monitoreó la concentración de cromo en el sobrenadante. Se determinó que L. laevigatum podía acumular significativas cantidades de cromo en su sistema, lo que sugiere que esta planta podría ser utilizada en el proceso de limpieza de aguas residuales.

TP110. Chlorella vulgaris: Eficiencia en la remoción de diferentes agroquímicos en condiciones de laboratorio


En el presente estudio se analiza la eficiencia de bioensayo de Chlorella vulgaris para remover Glifosato (Gli), Atrazina (Atr) y Endosulfán (End) de soluciones acuosas. Las microalgas fueron cosechadas en fase de crecimiento exponencial, centrifugadas y resuspendidas en agua destilada ultrapura estéril. Para cada ensayo se empleó 1L de efluentes con 1,93 (±0,08) mgL⁻¹ de Cr, un control -FBRs (efluente sin microalgas) y un tratamiento -FBRs (efluente con microalgas: 707333 cél.mL⁻¹). Se registró: pH, T°C, O₂ disuelto, agitación e iluminación. A las 6, 10, 24, 30 y 36 h se tomaron muestras de 50 ml, se centrifugaron separando el efluente del pellet (con microalgas). Ambas matrices fueron digeridas y analizadas por espectrofotometría de absorción atómica. Se calculó el % de remoción y se correlacionaron las concentraciones Cr acumuladas y las remanentes en el sobrenadante. Se aplicó t-Student para comparar los % de acumulación en pellet del control y el tratamiento. En el efluente de entrada al reactor se registró: Scenedesmus, Coixanmor, Cieolastrum y Euastrum, Hyfomyocytes, Epsistilis, algas filamentosas, nemáctides, tecambebas y pequeños flagelados. El de salida: Scenedesmus, Pediastrum, Gyrosigma, bacterias esporoquetas, ciliados de vida libre y pedunculados. Los % de remoción del tratamiento con algas fueron 59,22 %, 60,96 %, 62,79 %, 63,36 % y 60,69 % a las 6, 10, 24, 30 y 36 h respectivamente, obteniendo diferencias significativas entre controles y tratamientos (p=0,01). Se registraron correlaciones negativas significativas entre la concentración final de Cr en pellet y sobrenadante (r = 0,95; p =0,01), lo cual confirma el potencial de C. vulgaris como acumulador de Cr en efluentes industriales.

TP112. Decoloración y detoxificación del colorante trifenilmetileno verde de malaquita mediante hongos de pudrición blanca

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Los derivados de trifenil metano son una de las clases más antiguas de colorantes sintéticos. Presentan una coloración azul brillante e intensa, son relativamente baratos y pueden aplicarse a numerosos usos. El verde de malaquita (VM), aparte de su uso en la industria textil, tiene un uso extendido como antifúngico y control parasitario en acuicultura. En EE.UU. por sus propiedades teratogénicas se prohibió su uso. La baja eficiencia de los tratamientos biológicos ha hecho necesario buscar alternativas viables para minimizar el impacto de estos contaminantes. Los hongos de la pudrición blanca (WRF) poseen enzimas que pueden ayudar en este proceso de remedición con UV/H₂O₂. Los ensayos de remoción se realizaron en cámara de incubación bajo condiciones controladas (T=23 ±1°C, iluminación continua -3000 lux- y agitación diaria). A las 2, 4 y 6 (Gli) y a las 24 h (Atr y End) se centrifugaron (10 min a 3500 g r.p.m.). Se determinó Gli, Atr y End en el sobrenadante mediante UHPLC y GC-ECD. La eficiencia de remoción de Gli fue diferente para los distintos formulados (ANOVA, p=0,05). Dicha variabilidad posiblemente se deba a los coadyuvantes y aditivos presentes en la cada uno de ellos. C. vulgaris removió porcentajes máximos de Gli cuando fue expuesta al formulado Esko® (11,22 %) durante 6 h. A su vez, mostró ser más eficiente para remover End que Atr. No se encontraron diferencias significativas entre los porcentajes removidos de End en C1, C2 y C3, acumulando 95,34 %, 94,93 % y 95,93 % respectivamente. Porcentajes menores de remoción se obtuvieron al exponer a las microalgas a Atr (11,16 % y 51,39 % en C1 y C2 respectivamente), registrándose diferencias significativas entre las concentraciones iniciales y finales. Los resultados obtenidos sugieren que C. vulgaris es más eficiente para remover End respecto a los herbicidas, por lo que se recomienda su empleo en ensayos a mayor escala como complemento de procesos físico-químicos de remoción de invernaderas.
ligninosílicas capaces de degradar anillos aromáticos presentes en la lignina, como así también de otros compuestos aromáticos, como el caso de muchos colorantes. Phanerochaete chrysosporium, un hongo modelo de la pudrición blanca, es un WRF que posee la maquinaria enzimática para degradar la lignina, sin embargo exhibe una muy baja tolerancia al VM. Se realizaron los experimentos de degradación en extracto de malla agarrado (MEA), suplementado con un concentración de VM de 10 mg.l-1, y se realizó el crecimiento de P. chrysosporium. Se utilizaron los WRF: Coriolus antarcticas, Trametes versicolor, Trametes trogii, Ganoderma lucidum y Pycnoporus sanguineus y se midió tanto la velocidad de crecimiento del micelio como la del halo de decoloración para cada organismo. Una vez completada la decoloración, se recuperaron los medios agarrados agitándolos fundiéndolos y separando el micelio crecido por filtración, para luego reconstituir un medio de cultivo constituido por MEA/medio agotado libre de micelio en una proporción 1:1. Este medio reformulado fue autoclavado y plaquado, inoculando con P. chrysosporium (sensible al VM). Como control de toxicidad negativo se utilizaron medios reconstituidos a partir de MEA con cada organismo crecido y luego filtrado/MEA virgen, y como control positivo MEA-VM/MEA virgen. En todos los casos donde se produjo la decoloración, P. chrysosporium creció tanto en los medios degradados reconstituidos como en los medios agotados sin VM reconstituidos, mientras que en los medios VM reconstituidos, la inhibición del crecimiento de P. chrysosporium fue total.

TP113. Degradación del dismutor endocrino nonil fenol mediante hongos de pudrición blanca

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El nonol fenol (NP) es utilizado casi principalmente en la elaboración del tensioactivo no iónico nonol fenol etoxilado (NPnEO) mediante la condensación con óxido de etilo en diversas relaciones moleares, según la longitud de cadena etoxilada (EO) deseada. El etoxilato así obtenido puede tener cadenas entre 4 y 100 EO promedio, dependiendo del uso deseado, que va desde su utilización como anti espumante hasta detergente para altas temperaturas, respectivamente. Los tratamientos de efluentes convencionales (i.e.: barros activados) son eficaces en el acortamiento de la cadena etoxilada, pero producen acumulación de metales liposolubles (ej: NP, NP1EO, NP2EO), los que resultan mucho más tóxicos que los compuestos parentales, ya que tienen la capacidad de simular la acción de las hormonas estrogénicas, causando disrupción endocrina en diversos organismos. Para lograr la mineralización completa de estos xenosterógenos se ha explorado el potencial catabólico de hongos filamentosos, organismos que no son utilizados normalmente en el tratamiento de efluentes. Los hongos filamentosos causantes de la pudrición blanca (WRF) se caracterizan por una degradación selectiva de la lignina, polímero fenólico presente en la madera, por lo que ésta adquiere un color blanquecino. Esta capacidad ligninoílctica convierte a este grupo de organismos en candidatos a degradar otros compuestos contaminantes, como el caso del NP. En este trabajo se realizaron experimentos de degradación en un medio sintético agitado glucosa-asparagina (GA), suplementado con NP. Estos medios fueron inoculados con los WRF Phanerochaete chrysosporium, Coriolus antarcticas, Trametes versicolor, Trametes trogii, Ganoderma lucidum y Pycnoporus sanguineus, y el seguimiento de la degradación se realizó mediante cromatografía líquida de alta desempeño (HPLC) de extractos de dichos medios agarrados. Las concentraciones ensayadas estuvieron entre 0,5 g.l-1 y 5 g.l-1. En todos los casos la degradación del NP fue mayor al 85% (86,7% para el P. chrysosporium y 98,9% para Trametes trogii), lo que pone de manifiesto la potencialidad de este tipo de organismos para el diseño de estrategias eficientes para el tratamiento de xenobióticos recalcitrantes como el NP.

TP115. Dye-mediated covalent cross-linking of Type I collagen hydrogels

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A large family of azo dyes have been developed and used in the textile industry, including for leather tanning, and are therefore expected to exhibit strong interactions with collagen-based materials. Here we investigate the mechanisms of adsorption of the Remazol black B dye on type I collagen hydrogel. Higher and stronger retention of the dye is achieved in alkaline conditions, correlated with enhanced thermal and mechanical stability of the hydrogel. The formation of a covalent bond between the dye and the protein network via Michaels reaction is suggested and supported by the detailed analysis of the kinetics and thermodynamics of the sorption reaction. Sorption capacity of collagen hydrogel at pH 9.00 was ca. 1 mmol.g-1 (i.e. 1 g.g-1). Even in acidic conditions that are closer to natural waters, the capacity was > 0.5 g.g-1, larger than reported values for activated carbon. The adsorption process is fast, the adsorbent (collagen) is biodegradable, and azo dyes don't suffer rupture that could origin products even more toxic than the dye without degradation. The interaction between collagen and dye is chemically-stable limiting the risk of secondary contamination due to dye leaching from the sorbent. Another advantage of such hydrogels is their ability to reduce the generation of waste thanks to their strong reduction in weight and volume upon drying that should reduce the needed storage area leading also to costs reduction. Their application in water remediation would also constitute a new valorization route for industrial processes producing collagen as waste. Type I collagen hydrogels combine low cost, fast sorption, high loading and strong retention capacity together with low storage volume, making them promising materials for dye remediation. Dye-modified hydrogels may also find applications in the biomedical field.

TP116. Eficiencia de remoción de Cromo (Cr) de efluentes industriales por la microalgla Chlorella vulgaris en foto-bio-reactores


En el presente estudio se aborda la problemática de la contaminación por Cr mediante la aplicación de técnicas de remediación de efluentes industriales utilizando a C. vulgaris en foto-bio-reactores (FBRs), considerando la concentración del metal y el tiempo de exposición. Las microalgas fueron cosechadas en fase de crecimiento exponencial, centrifugadas y resuspendidas en agua destilada ultrapura estéril. Para cada ensayo se emplearon 1000 ml de efluentes con 1,93 (± 0,08) mg.l-1 de Cr, dos controles -FBRs (efluente sin microalgas) y dos tratamientos -FBRs (efluente con microalgas: 646000 cél.ml-1). Dicho efluente corresponde a la fracción tratada en planta con procedimientos físicos y químicos, previo al tratamiento biológico. Se registró: pH, °T, O2 disuelto, agitación (100 rpm) e iluminación. A las 24 y 48 h se tomaron muestras de 50 ml, se centrifugaron separando el efluente del pellet (sin y con microalgas). Ambas matrices fueron digeridas y analizadas por espectrofotometría de absorción atómica. Se calculó el % de remoción y se correlacionaron las concentraciones de Cr acumuladas y las remanentes en el sobrenadante. Se empleó ANOVA para comparar las concentraciones de Cr removido en los diferentes tiempos de exposición. Los % de remoción en el control (pellet sin algas) fueron 55.8 % (± 2.6) y 53.6 % (± 2.06), mientras que en los tratamientos con C. vulgaris (pellet con algas) fueron 66.3 % (± 0,05) y 65,54 % (± 0,16) a las 24 y 48 h respectivamente, con diferencias significativas entre controles y tratamientos (p = 0,0012). El Cr remanente en el sobrenadante disminuyó de manera significativa con el tiempo de exposición (0, 24 y 48 h - p < 0.01). El porcentaje más alto de remoción se obtuvo a las 24 h (66,3 ± 0.05 %). En controles y tratamientos con algas se registraron correlaciones negativas entre la concentración final de Cr en el pellet y en el sobrenadante, aunque sólo fueron significativas en los ensayos con algas (r = -0,6952; p = 0,0058). Se concluye que C. vulgaris es eficiente para disminuir concentraciones de Cr de efluentes industriales en FBRs, por lo que se recomienda continuar con los estudios de optimización en el escalamiento del proceso.

TP117. Evaluation of Ozonation and other Advance Oxidation Processes as methods to alleviate the toxicity of pharmaceutical industries wastewater

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Pharmaceutical pollutants have been found in surface water all over the world. The level of pharmaceuticals in surface water is generally below 1 mg per litre, often measured in ng per litre. This low concentration might seem to show that they hardly pose any problem to health and the environment. However, even though the compounds might be present in low concentrations they may exert other toxic effects rather than acute toxicity such as antibiotics resistance in natural bacterial populations and endocrine disruption in the case of steroids used in the contraceptive pills. Moreover, the concentration of some of the pharmaceutical residues in watercourses is likely to increase due to their non-biodegradable nature. The main objective of this research is to evaluate the effectiveness of the Fenton reaction, Peroxone and ozonation as an alternative method to alleviate the impact of the pharmaceutical pollutants generated by pharmaceutical industries in the Uruguayan context. Furthermore, two different ozonation technologies were tested and compared. On the treatment point of view, the present research showed that even 80% COD removal rates have also proved to be insufficient for ensuring an acceptable shortage of toxicity of the system. Ozonation had the best performance among the technologies tested. As secondary treatment, the biological oxidation experiment results showed that this may be a good alternative. Correct evaluation of any AOPs as wastewater treatment must not include only a study of the disappearance of the parent compound. A complete study of toxicity of the wastewater as evaluated by a battery of different bioassays, are always necessary. This research shows that the oxidation by-product may be more toxic than the parent compound. In some cases, AOP converted non toxic wastewater on toxic even with a good COD removal rate. Despite of the wastewater treatment solution recommended in this research, it is not possible to ensure that all pharmaceuticals pollutants were removed, however the present work demonstrated that the ozonation and secondary treatment can reduce the environmental impact of pharmaceutical industry wastewater. It was also concluded that, after at a maximum dose of 35 mg/l ozone, the wastewater did not show any toxicity according to the Daphnia Magna and Vibrio Fischeri toxicity tests.

TP118. Evaluation of phenol bioremediation process by two native bacterial strains using different toxicity tests

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Phenol constitutes one of the main sources of aquatic ecosystem contamination. Therefore, it is important to treat phenol contaminated solutions and effluents before their release to the environment. We have previously demonstrated that two native bacterial strains isolated from polluted sites, Aliciobacter tandemii RTE1.4 and Rhodococcus sp. CS1, were capable of removing this contaminant with high efficiency. However, the disappearance of a pollutant from a solution not always implies detoxification. Thus, the aim of the present work was to determine the toxicity of the remaining post-removal solutions (PRS) after a bioremediation process, using tests with organisms of different trophic levels. Phenol solutions initially containing 200 and 600 mg/L or 200 and 1000 mg/L of the pollutant were treated with A. tandemii sp. RTE1.4 and Rhodococcus sp. CS1, respectively. Then, PRS derived from these treated solutions, were analyzed using Microtox®, Microtox® and Lactuca sativa root bioassay. The toxicity of control solutions, such as culture media without phenol and culture media supplemented with phenol (without inoculation) was also evaluated. All the assayed phenol solutions, without bacterial treatment, were highly toxic for the tested organisms. Contrarily, the toxicity of PRS varied depending on the test employed, however it was generally observed that bacterial treatments significantly reduced the toxicity of solutions supplemented with phenol. A toxicity reduction of PRS was detected using Microtox® compared with untreated phenol solutions, while with AMPHITOX® and Lactuca sativa, PRS showed significant toxicity even after bacterial treatment. We suggest that it would be due to the high salinity of the culture media in which the reaction took place, and this effect could be reduced by water addition. Thus, as an alternative strategy, PRS were diluted and the toxicity of these samples was significantly reduced. This is a practice usually applied in plants for treating industrial effluents and represents a simple method for reducing the toxicity of PRS. This study showed that phenol removal process, using A. tandemii RTE1.4 and Rhodococcus sp. CS1, was useful to bioremediate solutions containing high phenol concentrations since the toxicity of PRS was significantly reduced.

TP119. Genotoxic evaluation of residual algal biomass used as an additive in feed for fish (Rhamdia quelen)

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Our planet suffers daily with the pollution caused by the large energy demand, especially from fossil fuels. Thus, there is a need to study and develop alternative energy sources to reduce and replace the petroleum-based fuels. The use of algae for biofuel production has aroused great commercial interest. However, there are several lines of study to standardize the production, harvest, lipid extraction and the use of by-products. In this work, the residual biomass was added to the fish feed. Microalgae were cultivated in photobioreactors with a synthetic medium (CaH) and after lipid extraction, defatted biomass was tested as an additive in the fish feed at concentrations of 1%, 2% and 3%. In feed manufacturing, a balanced diet with energy and protein supplementation was prepared. Thus, the objective was to evaluate the genotoxic effects of fish fed with these rations. We used 60 fish of the species Rhamdia quelen, which were divided into four groups: three of them with algae supplementation (1%, 2% and 3%) and a fourth control group without supplementation. During 60 days the feed was provided three times a day (ad libitum). After this time, the fish were anesthetized (10g/l benzocaine) and then killed by spinal cord section. The test used was the piscine micronucleus, with 2,000 erythrocytes analyzed. Nuclear abnormalities were also computed. The nonparametric Kruskal-Wallis test was used to determine differences between groups. The results showed no significant differences between the treated groups and the control or between the treated groups. We can conclude that the residual algal biomass can be used in the manufacture of fish feed, if we take into account only this test, however other genotoxic tests are being made prior to the marketing of this feed.

TP120. Improving Monitoring Methods for In-Situ Remediation of Contaminated Sediment Studies

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Several pilot studies have examined the efficacy of activated carbon on treating hydrophobic sediment contamination in-situ. The effects of activated carbon on the chemistry and bioavailability of sediment contaminants are typically evaluated using traditional sampling and analytical methods, such as bulk composited sediment samples for laboratory chemical and bioaccumulation analyses. However, the evaluation of in-situ remediation material efficacy in contaminated sediments requires modified collection methods in order to accurately determine bioavailability. Bulk sediment composite samples used for either chemistry or bioaccumulation testing will not provide accurate results, as these methods destroy the gradient of remediation materials, such as activated carbon, following application. Paired in-situ and laboratory bioaccumulation assays provide further lines of evidence. In all cases, co-located sampling in treatment and control plots should be utilized to determine efficacy both temporally and spatially. This poster discusses several methods for monitoring and evaluating bioavailability in contaminated sediments following the application of remediation materials.

TP121. Influencia del pH y tipo de planta en la remoción de cadmio y DQO en humedales superficiales

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Se realizó un estudio exploratorio experimental en la Sede de Investigación Universitaria de la Universidad de Antioquia, con el objetivo de “evaluar la Influencia del pH y tipo de planta en la remoción de cadmio y DQO en humedales piloto subsuperficiales”. Se utilizaron módulos de 0.6 m de ancho, 1.0 m de largo, 0.35 m altura de grava, 0.30 m altura lama de agua y 20 m/m de caudal de entrada. Se realizaron cuatro etapas con niveles de pH diferentes en el afluentes (7.0, 6.0, 5.0 y 4.0 unidades de pH), cada nivel se trabajó con un módulo sembrado con Typha domingensis, otro con Phragmites australis y uno sin plantas. Se realizaron seis muestras por cada etapa, tomando muestras en el afluentes y efluente de cada módulo, midiendo parámetros. In Situ como oxígeno disuelto, conducividad, pH y potencia Redox, así como el seguimiento del cadmio. Para cada etapa se midieron diferentes parámetros en el programa Stagraphics Centurión. El valor del pH en el afluentes de los humedales no influyó en la remoción de Cadmio y DQO. Igualmente no se presentaron diferencias significativas en las concentraciones de ambos parámetros según el tipo de planta (Anova Valor p < 0.05). La concentración de Cadmio promedió en el afluenes fue de 511 µg/L, el efluente del humedal sin plantas presentó una concentración promedio de 5.6 µg/L, el de Phragmites de 9.0 µg/L y el de Typha 17 µg/L, para una remoción de 98.7%, 98.2% y 96% respectivamente. Adicionalmente para la etapa con pH 4 se obtuvo 93%, para pH 5.98%, para pH...
6 96% y para pH 7 97% de remoción respectivamente. La concentración promedio de DQO en el afluentes fue 405 mg/L, el humedal sin plantas y el plantado con Phragmites tuvieron una concentración en el afluentes de 26 mg/L, y el de Typha de 27 mg/L. En las cuatro fases se presentaron porcentajes altos de remoción, para la de pH 4, 94%, para pH 5, 92.3%, para pH 6, 93.5% y para pH 7, 94.0%. Independiente del nivel de pH en el afluentes el Cadmiyo y la DQO presentaron remociones superiores al 90%, ni la variación de los niveles de pH ni el tipo de planta tuvo influencia en la remoción de los dos parámetros de estudio.

TP122. Prospección de hongos filamentosos resistentes a metales pesados

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El incremento de las actividades relacionadas a la industria del cemento, colorantes, curtientes, fertilizantes, materiales fotográficos, pinturas antirrocastas y, en mayor medida la minería, constituyen las principales fuentes de contaminación de los suelos con cromo trivalente y hexavalente. Este tipo de contaminación tiene un impacto directo sobre el ambiente y afecta, de forma indirecta, a la biota. Existen diversas estrategias para el tratamiento de metales pesados, siendo la más común la precipitación, sin embargo muchas veces son incompletas su remoción y/o resultan económicamente inviables. La utilización de microorganismos como una alternativa potencial para la remoción y recuperación del metálico está cobrando un creciente interés debido a su bajo costo, escaso consumo de energía y por ser ambientalmente seguros. El fundamento de esta alternativa se basa en la gran capacidad de los materiales biológicos de adsorber los metales, y en muchos casos, de concentrarlos. El objetivo de este trabajo consistió en evaluar la resistencia a metales pesados hongos filamentosos de pudrición blanca (WRF) y degradadores de hongos resistentes a metales pesados (LDF), además de determinar el posible efecto protector de compuestos derivados del metabolismo de la lignina. Por otra parte se estudió la relación entre la resistencia al metal y el efecto del protector con la actividad de enzimas ligninolíticas. Para ello, se utilizó cromo hexavalente (CVI) como modelo y se determinó la velocidad de crecimiento de las distinas cepas en un medio agarizado conteniendo Cr(VI) una concentración 1 mM. De las 24 cepas evaluadas, se determinó la concentración efectiva 50 (EC50) de aquellas cepas que fueron capaces de crecer en el medio (6 WRF y 7 LDF). De cada grupo de hongos, se seleccionaron las dos cepas con mayor EC50 para evaluar el efecto protector del ácido vanillicosobre el crecimiento del hongo. Paralelamente, se observó un incremento en la actividad enzimática delacasa y Mn peroxidasa en los hongos resistentes al cróm y en los tolerant. I. lacteus BAFC 1171 y P. sajor caju secretada laccase con y sin protector, respectivamente. El incremento de las actividades enzimáticas de aquellas cepas con tolerancia de metales pesados, como el cróm, es una ventaja para su posible uso en biociones.

TP123. Removal of 2,4-DCP using free and immobilized plant peroxidases: toxicity analysis of the post-removal solutions

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Contamination of natural waterways is one of the major environmental problems facing the world and it threatens human health and the environment. Phenolic compounds such as 2,4-dichlorophenol (2,4-DCP) are among the most hazardous pollutants. Different strategies have been applied to remove phenolic compounds, however toxicity analysis of the products generated in the process is not done. Plant peroxidases are enzymes that can catalyze oxidation of these compounds using H2O2 as co-substrate and could potentially be applied for remediation of contaminated water. In this work, the potential biotechnological application of total peroxidase crude extracts (TP) obtained from tobacco (Tab) and turnip (N) hairy roots for 2,4-DCP remediation is analyzed. Removal efficiency of this phenolic compound was determined using free or immobilized in calcium alginate enzymes and the ion exchange resin carboxymethyl Sephadex (CMS). Subsequently 2,4-DCP and post-removal (PR) solutions toxicity was analyzed using the ANFITOX test, and estimation of the chemical nature of the products generated during the process was performed by electrochemical techniques. Application of Tab and N crude extracts, both free and immobilized, to 25 mg/L 2,4-DCP solutions allowed to obtain high removal efficiencies. However, these results do not always were correlated with a decrease in the toxicity of post-removal (PR) solutions. Electrochemical studies indicated that 2,4-DCP oxidation mechanisms catalyzed by peroxidases are complex and that intermediate compounds formed during the first hour of reaction, including quinones, would continue reacting and polymerizing by spontaneous physico-chemical mechanisms until 48 h after incubation. The toxicity observed in PR solutions could be attributed to the formation of the intermediate products.
TP126. Two different Solar Power Plant Technologies - What kind of impacts do they have on microclimate of deserts?

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Solar power plants are known to be a truly renewable energy form, and their environmental impact is considered to be minimal especially in dry deserts. We studied two power plants in the world’s driest desert, Atacama Desert, in Chile. Although the Atacama biodiversity is very scarce, it has a large number of endemic arthropod species and that is why it is important to understand what kind of impacts different solar power plant technologies may create. Moreover, it is important to use this information to construct the solar power plants sustainably.

We compared two photovoltaic technologies, fixed and solar tracking tables, to know what kind of microclimate they create and which one has a lower impact on the ground moving arthropods composition. This study aims to compare what kind of impacts solar power plants create on the Atacama Desert around the solar power plant. We studied the fixed solar power plant in the valley of Copiapó (Atacama region) and the solar tracking system in Pozo Almonte (Tarapacá region). Fixed table creates a more constant shadow below the panel unlike moving table where the shadow is moving between both sides of the panel. In solar tracking tables the shadow is only a few hours below the panel during the midday and so the microclimate that they create is very different. Some arthropod groups were affected by the change in microclimate in both solar power plants, but more groups were affected in the fixed table system compared to its control area. In both solar power plants Coleopterans were more abundant in solar power plant areas than in the desert around them although in the solar tracking system the result was not statistically significant. Therefore, we concluded that the solar tracking system might have a smaller impact on the Arthropods in the Atacama Desert arthropods than the fixed tables have, although future studies are necessary to confirm these preliminary results.

Modelling

TP127. Oxidative stress toxicity in zebrafish and fathead minnow: towards the design of safer chemicals.

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Over 85% of the approved commercial chemicals in the U.S. lack experimental health and safety data. Unfortunately, little progress has been made in the design of chemicals with reduced hazard to humans and the environment. The fourth Principle of Green Chemistry states that “chemical products should be designed to preserve efficacy of function while minimizing toxicity”. In this project, we employed in vivo toxicological data in two model species, zebrafish and fathead minnow, to initially identify compounds that elicit oxidative stress responses, a biochemical imbalance leading to cellular damage and associated with cancer, neurodegenerative diseases, cardiac function, and infection among other diseases. This unique comparative toxicity approach includes both a model used in biomedical studies and a model used in ecotoxicology. The goal of the study was to define relationships between traditional endpoints and oxidative stress responses following exposure to eight compounds with the objective to build computational models that associate oxidative stress parameters with chemical attributes. Following OECD FET and EPA WET guidelines zebrafish embryos and fathead minnow larvae were exposed for 96 h to bisphenol A, camene hydroperoxide, dinoseb, hydroquinone, indene, perfluorooctanoic acid, R-carvone, and tert-butyl hydroperoxide. Range-finding tests were conducted to determine 96 h LC50 values, and fish were then exposed to LC50, 40% LC50, 20% LC50, 10% LC50, 5% LC50, solvent control, and control. Mortality was recorded daily. Larvae growth rate (mg day⁻¹) and fathead minnow (mg day⁻¹) larvae were counted at each replicate representing a pool of 10 or 15 zebrafish and a pool of 5 fathead minnow for each oxidative stress endpoint including lipid peroxidation, total glutathione, DNA damage, and mRNA expression of catalase, gsp, gclc, superoxide dismutase, and mrf2. Differential sensitivities were observed between fish models, chemicals, and response variables examined. Ongoing efforts include computational modeling to identify structural alerts and potential sustainable molecular design guidelines for reduced toxicity of industrial chemicals.

Life Cycle

TP128. Allocation of Agricultural Impacts: which is the best reference flow? A case study on vineyards

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Agriculture is a very important production process of raw materials when studying different product systems through LCA methodology. The environmental contribution of agriculture is significant in many cases, this is why there have been many efforts to improve agricultural cultivation of different crops. The main aspects contributing to environmental impacts of agriculture refer usually to the energy consumption of agricultural field works, consumption of water, fertilizers, pesticides, herbicides, etc. for crop growing and wastes on harvesting. All these consumptions could seem related to the area of cultivation, thus a good reference flow would be 1 ha of land. On the other hand, many of these inputs, such as the amount of fertilizer or water irrigation for example, seem to have a great importance on the crop yield. Therefore, a reference flow could also be 1 kg of crop produced. Although both reference flows seem to be equally justified as to be used on LCA studies, it is important to assess their robustness in every case study. We are presenting here a case study on 20 different vineyards studied within two projects: the “CO2 Vino” project (financed by the European Social Fund through the Program empleaverde from Fundación Biodiversidad) and VINECO project (financed by the Euroregion Pyrenees-Mediterranean), both coordinated by Cycles Value Solutions. The results show that 1 kg of grape produced is the best reference flow to be used in this case, because when using 1 ha of land, a much greater standard deviation from the average values is obtained.

TP129. Calculating tourism's carbon footprint of Spanish coastland hotels

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Tourism is an important sector of the Spanish economy and is the third most popular tourist destination in terms of international tourist arrivals in the entire world. The country received 60.6 million foreign tourists in 2013. Tourist population generally is concentrated in coastal areas of Spain, and due to growing number of population in these locations, the normal use of infrastructure in terms of energy, water and waste management alters, leading to coastal erosion and negative environmental impacts. There are numerous studies and applications of the LCA methodology in the field of tourism at different locations around the world, however Spanish tourism industry is seldom studied and there is a lack of detailed inventory data for benchmarking and performance measurement for hotels in coastal region of Spain. This case study introduces the Life Cycle Assessment (LCA) analysis, performed in the frame of SOSTUR project, to quantify and evaluate the environmental impacts related to accommodation categories such as 5, 4 and 3 stars hotels in Spain. LCA has been carried out using the GaBi 6 Software (Thinkstep) using CML 2009. The results provide a clear picture of the environmental profile of the hotel sector in Spain, and main potential hotspots are identified as electricity consumption and water consumption in direct proportion to higher number of stars and lower occupancy rate.

TP130. Environmental assessment of quillaja saponin used as a degreasing agent in leather industry

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Saponins are natural surfactants found in a variety of plant species, especially desert plants. Quillaja saponaria, which is native to Chile, Brasil and Argentina, is one of the major desert plants that is mainly used for extraction of commercial

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saponins. Because of their surface-active effects, quillaja saponins come into use in a number of industrial and commercial applications, which take advantage of their generally non-ionic surfactant properties. In leather industry, potential applications of biosurfactants include their use as emulsifiers in degreasing, wetting and penetration, and promoters in tanning and dyeing. In this study environmental impacts caused by application of plant derived saponin biosurfactant as an alternative natural option in comparison to chemical surfactants for the degreasing of sheep skins was investigated. A comparative life cycle assessment of degreasing processes using Quillaja saponaria as a primary representative of plant derived biosurfactants, has been carried out using the GaBi 6 Software (Thinkstep). The environmental impacts were obtained using factors defined by Centrum voor Milieukunde Leiden (CML), which were updated in 2009.

TP131. Evaluating the microalgae biodiesel environmental feasibility through a Fuzzy controller

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Biodiesel are gaining increasing importance as potential substitute for fossil-diesel fuel all over the world. Brazil plays an important role in the biodiesel world market. The use of biodiesel in Brazil is attractive due to the availability of agricultural land and the wide variety of oil-seed crops that can be cultivated. However, these fuels derived from biomass may have some drawbacks, such as the companies that have incorporated the practices and methodology of LCA have been used to compare the feasibility of five scenarios for biodiesel production systems with microalgae (Chlorella vulgaris), based on the “dry route” model: the single system of biomass production (C0); the application of pyrolysis on the residual microalgal biomass (cake) from the oil extraction process (C1); the same as C0 but in an anaerobic digester (C2); the same conditions as in C1 and C2, by integrating in both cases (respectively C3 and C4); and the cultivation with an autonomous ethanol distillery. The system modeling was performed using the MATLAB coupled to the complement Fuzzy Logical Toolbox. Mandani proposed the inference system used to obtain the results. The defuzzification method chosen was the Center of Gravity. The results showed the lowest feasibility for C0 (25%), and a high feasibility for the scenarios C1 and C2 (63% and 75%, respectively). These results confirm the unfeasibility of producing microalgae biodiesel autonomously and the high potential of feasibility of microalgae biodiesel when the production is integrated with ethanol sugarcane production (via co-products).

TP132. Implementation of Life Cycle Assessment in Brazil: programs, challenges and opportunities

W. Moto, IBICT / Information Science PostGraduation Program

In general, in developing countries, it can be said that the interest of industry and government in the Life Cycle Assessment (LCA) is still low, in an ordinary way all activities related to this subject are developed by academia and research institutes. On the other hand, the requirement of environmental labeling for products manufactured in developing countries may become a trade barrier, as these products will be inserted into this product supply chain and will be dealing with the markets of the developed world. The creation of LCA programs in Latin America is a challenge, LCA studies are still incipient, for conducting an LCA requires specialists, high costs, time, skilled professionals and data. was created the Life Cycle Latin American Network, a partnership of educational and research institutions in Brazil and other Latin American countries. LCAla in Brazil is not a fully widespread tool, where a few companies have mainly used for prototyping their products. Brazil still faces major difficulties in developing an appropriate methodology to their reality, since the LCA is highly related to regional circumstances, because lack of this, many studies are based on the SO 14040 standard. Regarding the dissemination and promotion of the LCA practices, Brazil has some proposals undertaken and in progress, currently the main programs are: Life Cycle inventory Project for \"Environmental Competitiveness of Brazilian industry; the Ontology Life Cycle Program and the \"Brazilian Program of Life Cycle Assessment. Set a LCA program in a country like Brazil, should be initially based on its own database, which incorporates regional disparities, mainly owing to the climate diversity in the vast Brazilian territory, due also to the diversity on the geology, geomorphology, physical and climatic conditions, biomes, energy matrices available, types of \"products and different economic sectors. Brazilian still faces problems with subjects related to the LCAla databases, data collection and data quality objectives. An information-sharing network \nand exchange experience facilitated the LCA development process in the world, which may be a tool for Brazil. The paper main proposal is to present the importance of the life cycle assessment (LCA) \nmethodology for Brazil, point out the Brazilian proposals, which are designed to allow a wider use of LCA, the challenges to the effective implementation of the methodology in Brazil and the opportunities to do.

TP133. Life Cycle Assessment from Artemisia sp. test to evaluate the toxicity of Copper Oxide Nanoparticles

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In recent years, copper oxide nanoparticles are widely used in electronic devices, optical and electronic, also for their antimicrobial properties. Therefore the impacts of these nanoparticles are mostly unknown. Thus, the toxicity studies could be useful to assess the impacts of these nanoparticles in cells, organisms and ecosystems. However, there is a knowledge gap concerning the impact to the environment in research laboratories that study this kind of nanoparticle. This study aims to develop a gate-to-gate Life Cycle Assessment (LCA) by comparing two different models of testing the toxicity of Copper Oxide with Artemisia sp. The first one with disposable plastic cups as containers to the test and the second one using reusable glass breakers. The LCA methodology encompasses as main steps the goal and scope definition, the inventory analysis, the impact assessment and the interpretation. To evaluate the results, SimaPro 8 from PrC-Consultants was used. Results shown that the most critical processes are from the steps in which there are high resources consumption, like washing processes and electricity consumption. The studied model with plastic cups is less impactful than the one based on reusable glass breakers, because the resources consumption for washing glassware is lower, for example. Therefore, it is suggested to study others toxicity assays to verify the potential impacts to the environment. Acknowledgements: This study was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq - Brazil) process number 200368/2014-1, Universidade da Região de Joinville and Università do Québec B Montr al.

TP134. Life Cycle Practices: driven forces to eco-innovations

W. Moto, IBICT / Information Science PostGraduation Program

Most of the production of goods and services develops at the expense of use of natural resources and the production and generation of discharges along the production process. The current economic model based on production and exacerbated consumption had an effect of global warming, the increasing depletion of natural resources, among other serious problems that cause the deterioration of living conditions on the planet, leading the world on an unprecedented ecological crisis, this fact has led to a need for review of industry practices. Among the practices and tools that have arisen for this purpose, the ones related to the product life cycle has received more attention and recognition for its comprehensiveness and possibilities of use. Life Cycle Thinking (LCT), 'unpointed as a holistic approach that examines the impacts of a product, from its 'origins, from the extraction of materials, considering the production and use, until its final disposal, LCT is the proposal that brings the definition, the inventory analysis, the impact assessment and the interpretation. To evaluate the results, SimaPro 8 from PrC-Consultants was used. Results shown that the most critical processes are from the steps in which there are high resources consumption, like washing processes and electricity consumption. The studied model with plastic cups is less impactful than the one based on reusable glass breakers, because the resources consumption for washing glassware is lower, for example. Therefore, it is suggested to study others toxicity assays to verify the potential impacts to the environment. Acknowledgements: This study was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq - Brazil) process number 200368/2014-1, Universidade da Região de Joinville and Università do Québec B Montr al.
the LCA interpretation phase there are opportunities for changes and improvements in processes and products chains, such opportunities can 'generate environmental innovations, also known as eco-innovations. Such eco-innovations may occur through different ways of combining materials and labor force, generating new products or entering a new attribute to an existing product 'in a new production method, the discovery of new sources of raw materials, the 'inclusion of a production of a product, and others. Even innovations alone is not able to account for the ecological lynchpin, it is an essential part of this confrontation. In this sense, the eco-innovations calls have promising prospects. This bibliographical study, seeks to represent the important role of life cycle thinking for the generation of eco-innovations, as ways to contribute to environmental impacts reduction, representing the importance of eco-innovations in the contemporary scene.

TP135. Proposing a Fuzzy controller to assess sustainability of biodiesel under a multi-criterial perspective
E.L. Ribeiro, Department of Mathematical Sciences and Technology DCAA; H.L. Maranduba, State University of Santa Cruz - UESC / Department of Agricultural and Environmental Sciences DCAA; F. B. Oliveira, State University of Santa Cruz - UESC / Department of Mathematical Sciences and Technology DCET; J.A. Almeida Neto, State University of Santa Cruz - UESC / Department of Agricultural and Environmental Sciences DCAA

In the current global energy scenario, biofuels have been identified as the potential partial substitutes for fossil products in the energy supply, especially in the transportation sector. In this scenario, Brazil emerges prominently due to its agricultural land availability and wide variety of crops with potential for the production of fuels. However, fuels derived from biomass may present some drawbacks such as competition for arable land, expansion of planted areas, land use and high demand for raw materials and energy. These factors may contribute negatively to economic, technical and environmental feasibility of biodiesel from microalgae. Studies that assess the environmental performance of biodiesel often use the Life Cycle Assessment (LCA) methodology, which accounts all inputs (energy and raw materials) and outputs (emissions, wastes and products), from the agricultural phase until the burning engine. One of the LCA limiting as a support tool to assess the feasibility of a product, however, is that the environmental variables (impact categories) are analyzed separately, making it extremely arduous and subjective to get conclusions about the life cycle that has been studied, even only environmentally. In this issue, the Fuzzy Logic appears as a tool with enormous potential to aggregate, in a qualified way, not only the environmental variables extracted from LCA but also the economic and technical variables in order to build a model that can assess the sustainability of biofuels. The objective of this study was to develop a generic analysis model, using Fuzzy Logic and the application of the model in case study, in order to assess the sustainability, considering the following variables: Carbon Footprint, Energy Balance, Production Costs and Productivity. The parameters to build the model came from literature and experts advices. The system modeling was performed using the MATLAB coupled to the complement Fuzzy Logical Toolbox. The inference system used to obtain the results was proposed by Mamdani (1974). The defuzzification method chosen was the Center of Gravity. The results showed the great potential of Fuzzy Logic as a tool to deal with uncertainty and variability to assess sustainability of the biofuels. The proposed model and parameters, built by expert opinions, can be the basis to assess the production of any kind of product, contributing as a decision support tool, within a multi criteria analysis perspective.

Environmental Education

TP136. Application of scientific method in the study of the environment: training workshops for school teachers in the Araucanía (Chile)
J. Ramírez, Flores, Universidad de La Frontera / Departamento de Ciencias Químicas y Recursos Naturales; C. Hernández, Universidad de La Frontera / EXPLORA Departamento de Ciencias Químicas y Recursos Naturales; A. Arias, Universidad de La Frontera / Departamento de Ciencias Químicas y Recursos Naturales; M. Arias, F. Gallardo, Universidad de La Frontera / EXPLORA Departamento de Ciencias Químicas y Recursos Naturales

Training in scientific method is highly relevant to encourage environmental research in the school community. This is the goal of EXPLORA, a program founded by CONICYT (Comisión Nacional de Investigación Científica y Tecnológica) in 1995, contributing to the development of a scientific and technological culture. In the Región de La Araucanía, EXPLORA was founded in the Universidad de La Frontera (2000). One of the main activities organized by EXPLORA is the “Congreso Regional Escolar de Ciencia y Tecnología” (CRECT). In this event, students of primary and secondary schools show the results of their scientific and technological research to the local community. All research is carried out under the guidance of their respective teachers. Since the congress started, a problem observed by EXPLORA was the relatively low number of participants, therefore, a workshop for teachers about scientific method was organized. In this congress, it is usual to received an average of 25 participants (60% of primary education). Regarding only new participants of the workshop, 31% of them sent an article to the congress (annual average), however, this value increases when participants of previous years are also considered. Thus, while in 2014 only 21% of participants sent an article to the congress, this value increases up to 55% when participants of 2012 and 2013 are considered, confirming the growing impact of the workshop. These results allow to determine future lines of action, such as a) To increase the number of participants coming from rural zones (massive diffusion) and b) To organize a monitoring system of participants during the development of research. This system can be carried out by PhD students of the Universidad de La Frontera.

TP137. La ciencia al servicio de la sociedad: acciones en ecotoxicología acuática como herramientas de la gestión ambiental

El desconocimiento de los riesgos provocados por el manejo inadecuado de plaguicidas y efluentes industriales, se manifiesta de varias maneras en las sociedades, generando en muchas ocasiones abordajes inefectivos, en donde el planteamiento de posibles soluciones no contempla la totalidad de las dimensiones que abarca el ambiente. El objetivo de este trabajo es propiciar la articulación entre la Universidad y otros niveles del sistema educativo mediante acciones de difusión y transferencia en el área de la ecotoxicología acuática, además de aportar herramientas para fomentar una interpretación crítica de la información que reciben y de la legislación ambiental. A partir de la realización de actividades de investigación y extensión se busca concientizar a alumnos avanzados y docentes de la Escuela de Ciencias y Tecnología Juvenil de San Cristóbal y de seis escuelas primarias de San Justo (Santa Fe, Argentina), respecto a problemáticas ambientales regionales generadas por actividades antrópicas y cómo las mismas afectan tanto a la biota acuática como a la salud de los pobladores. En cada institución se realizaron talleres teórico-prácticos que implicaron el debate de la problemática propuesta y el abordaje desde diferentes herramientas de gestión ambiental, entre ellas la educación ambiental y el análisis de políticas y normativas ambientales. En función de los resultados obtenidos, consideramos que la capacitación de alumnos, docentes y futuros docentes en aspectos relacionados con la contaminación ambiental favorecieron la difusión clara de los conceptos, generando así un deseable efecto multiplicador, tendiente a modificar la actitud de indiferencia ante el riesgo. Los talleres permitieron promover el acceso a los conocimientos básicos de la Ecotoxicología, contextualizar la temática dentro de la problemática actual, reflexionar y adquirir habilidades prácticas elementales para el análisis y transmisión de saberes a sus pares. Finalmente, cabe destacar que a lo largo de las actividades, tanto los docentes como los destinatarios del curso, valoramos positivamente el trabajo realizado, alcanzando las expectativas mutuas y favoreciendo propuestas para futuros encuentros.

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Desde el inicio de la urbanización de Montevideo, la Bahía de Montevideo (Río de la Plata medio) se encuentra bajo la influencia de distintos impactos antrópicos como el vertido de efluentes urbanos e industriales provenientes de la cuenca y actividades portuarias ocasionando una importante modificación física, química y biológica del entorno. Para evaluar estas alteraciones existen diversos índices de contaminación que permiten analizar tendencias y determinar la evolución de las condiciones ambientales. Con el fin de establecer la evolución temporal del contenido de metales y su relación con la calidad del sedimento, se determinaron los índices: Factor de Enriquecimiento (FE) (As, Cr, Cu, Mn, Ni, Pb y Zn utilizando Sc como referencia), Pollution Load Index (As, Cr, Cu, Mn, Ni, Pb y Zn) y Sediment Pollution Index (Cr, Cu, Ni, Pb y Zn). Los índices se determinaron a partir de un testigo de sedimento (63 mm diámetro y 149 cm de largo, seccionado en estratos de 1 cm.) colectado en la zona interna de la Bahía de Montevideo durante julio 2010. Para determinar las concentraciones de metales, las muestras se digirieron parcialmente de acuerdo al método USEPA3050B y se cuantificaron mediante ICP-OES. Los resultados de los tres índices presentan un comportamiento similar, con valores que indican niveles base o ligeramente superiores de contaminación desde la base del testigo y hasta el estrato 31-32. A partir de este estrato y hacia la superficie los valores aumentaron, indicando un deterioro progresivo de la calidad del ambiente en la zona. Sin embargo, se observa una recuperación del PI y SPI en los estratos más superficiales (del 0-1 hasta el 8-9), debido principalmente a la disminución en las concentraciones de Pb y Cr. Estos resultados coinciden con otros estudios realizados en el área considerando otras variables, donde infieren que el inicio del enriquecimiento por metales corresponde con el comienzo del desarrollo industrial del área debido al aumento de curtímeiros y frigoríficos.

**Wednesday**

**Metal Session**

**WP001. Análisis histórico de la contaminación por metales en la Bahía de Montevideo, Uruguay**

C. Bueno, E. Bragagnoli, Facultad de Ciencias Udelar, R.C. Figueira, University of São Paulo - USP / Departamento de Oceanográfica Física Química e Geológica; P. Muniz, F. García Rodríguez, Facultad de Ciencias UdelarR

**WP002. Availability assessment of Pb, Zn and Cd in the surface soil portion of a former mining area: Adrianopolis-PR**

M. C. Kauzmedj, J.Z. Lima, University of São Paulo / Department of Geotechnics; J.B. Sigolo, University of São Paulo / Institute of Geology; V.G. Rodrigues, Universidade de São Paulo / Department of Geotechnics

Potentially toxic metals (PTM) are found in the environment as a result of pedogenic processes, weathering of the parent rock and due to human activities. Some PTM such as Zn, Cu, Ni are considered essential to life, while others, such as Cd and Pb are considered non-essential. In the case of non-essential metals, these are likely to cause toxicity to the biota, even when in low concentrations; on the other hand, essential metals can potentially cause toxicity when concentrations exceed a given value. Soil contamination by these metals is mainly due to improper waste disposal; whereas the disposal of mining waste is a major source of contamination. In this context, to detect contamination and availability of Cd, Pb and Zn in a former mining waste disposal area, 5 surface soil samples (0-20 cm) were collected in the city of Adrianopolis (Ribeira Valley, Brazil). The samples were defragmented, homogenized and, analyzed for the total concentration of metals, chemical fractionation and solubility. The total concentrations of Cd, Pb and Zn were high, surpassing soil guiding values of CONAMA and CETESB (prevention values). However, Pb and Zn were mainly associated with the Fe-Mn oxides. Although Cd total concentration was low, it was also associated with the exchangeable and carbonate fraction, thus, considered more available to the biota. The soluble concentration of Cd and Pb were higher than the limit recommended by the ABNT NBR 10004:2004; while the concentration of soluble Zn was below this limit, indicating that Zn is strongly sorbed onto soil constituents. Thus, it can be concluded that the surface soil from Adrianopolis (PR) is contaminated with Cd, Pb and Zn, and although Pb is mainly linked to the Fe-Mn oxides, it is also present in the soil solution, as evidenced by the solubility analysis. Non-essential metals Cd and Pb are present in the soil in soluble forms, and therefore available and amenable to leaching into the soil horizon. As for Zn, even though it is present in extremely high concentrations, its availability is low as evidenced by chemical fractionation and the solubilization test.

**WP003. Bioaccumulation and viability of normal and cancerous human breast cells when are exposed to mercury**

M. Avila, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Cuyo. Mendoza / Laboratorio de Química Analítica y Desarrollo. J. Shorter. Instituto de Oncología (INCT) / Laboratorio de Química Analítica para Investigación y Desarrollo

Mercury is a widespread pollutant and one of the most toxic heavy metal, classified as 3th class carcinogen by the International Agency for Research on Cancer (IARC). Mercury chloride (HgCl2), falling into the subclass of bivalent cationic metals, is considered a metalloestrogen because it may activate estrogen receptors (ER). Moreover, metalloestrogen effects of Hg have not been investigated as Cd. Since Hg remains a serious threat to human health, it is an important goal to study the effects of this metal on biological systems. The aims of this work were to determine the viability of ER positive MCF-7, and ER negative MDA-MB-231 and MCF-10A cells after a 3-h treatment with HgCl2, testing for possible differences in Hg uptake by these cells lines. Citotoxicity assay was carried out by MTT, and for protein assay there was chosen BCA method. Intracellular Hg was measured by atomic fluorescence spectroscopy (AFS). The results showed differences between the cell lines concerning their sensitivity to Hg toxicity. MCF-7 and MCF-10A cells showed higher Hg resistance than ER positive MCF-7 cells, but at higher Hg concentration MCF-7 cells were more resistant. Furthermore, MCF-10A cells showed higher Hg bioaccumulation than MCF-7 and MDA-MB-231 cells at higher metal exposure. These differences in Hg uptake in the cell lines may be due to their origin, the presence of ER and different mechanisms of Hg uptake/efflux reflecting changes in the metal sensitivity. These findings open further opportunities and challenges to understand specific molecular mechanisms of Hg toxicity in mammmary cells.

**WP004. Biomagnification of heavy metals in the food web of the Martel Cove, Admiralty Bay, Antarctica**

T.H. Hoppe Trevizani, Universidade de São Paulo / Oceanografia Química; C.Y. Theophil, A.P. Ribeiro, M. Petit, T.N. Corbiser, University of São Paulo USP - R.C. Figueira, University of São Paulo - USP / Departamento de Oceanográfica Física Química e Geológica

The Antarctic continent is considered a slightly impacted environment, but with the increase of human activities and the number of research stations there is a tendency to enhance the levels of some contaminants in the place. In this study we established the arsenic, cadmium, lead, copper, chromium, mercury, nickel, zinc levels, and the isotopic ratio of nitrogen in organisms samples from different trophic levels collected in 2003 in the Martel Cove, Admiralty Bay, Rey Gei Island. In this area, the research stations Comandante Ferraz (EACF, Brazil) and Machu Picchu (Peru) are installed. The behavior of these elements in the food web and the occurrence of bio magnification were verified. The analyzes of metals followed the USEPA (1994) methods, adapted from Moreira (2010), and they were performed by means of Optical Emission Spectrometry with Inductively Coupled Plasma (ICP-OES). For Hg, it was used vapor generation attached to ICP -OES. In order to ensure the quality of the data generated we analyzed, in parallel with the samples, white reagents, standard curves, and certified reference materials, which showed a recovery between 87 and 100%. The analysis of stable isotopes of nitrogen (615N) was carried out by Stable Isotope Facility at the Department of Agronomy and Range Science, Davis, California, US, through the mass spectrometer for isotopic ratio 20/20 Europa Hydra. The results were described by means of multivariate statistical analysis, which assisted in the assessment of the elements over the trophic levels. As expected in an environment with low bioavailability of contaminants, the occurrence of bio magnification of Hg was not observed. Only Zn tended to bio magnification in the food web of Martel Cove, and its presence has been attributed to natural levels of this element in the geological composition and high levels in sediments. These results are useful for the knowledge of the levels of these elements in pre-accident EACF conditions that occurred in 2012 and current post-accident conditions within the monitoring work that is being carried out by the INCT-APA (National Institute of Science and Technology Antarctic Environmental Research).

**WP005. Biomarkers of exposure and effect in the estuarine polychaete Laeonereis acuta exposed to cadmium**

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Cadmium (Cd) is a heavy metal with environmental relevance due to its high toxicity, persistence and accumulation in the trophic webs. L. acutus is a polychaete found in many biomonitored sites. Metal levels in the hair of individuals were higher than the guideline values established by the Canadian Council of Ministers of the Environment. The results showed concentrations between TEL and PEL for the elements Cu, Hg and Zn, indicating moderate risk to the biota, and above the PEL for Pb, which is the likely cause of the contamination of metal, above the PEL only in the vicinity of the mine. In the case of Hg, the concentrations are due to the use of this substance in the practice of panning occurring for over 100 years in the region. The risks caused by Cr are related to natural fluoride in the region, as well as occurrence of leather tanning. Zn, Ni and Cu may be related to the waste, since higher concentrations were the highest point that receives the discharge of sewage. The Cd offered no risk in any of the analyzed points. It can be concluded that in the study area, there is need for sewerage development and greater control of the practice of mining and mining.

WP009. Calidad de los sedimentos del Riachuelo en relación con la vida acuática y disposición del material dragado

A. Rendina; A. Fabrizio de Iorio, Universidad de Buenos Aires; A.L. Bursztyn

El Río Matanza-Riachuelo es el colector principal de una cuenca de 2300 km², y atraviesa la zona más densamente poblada de Argentina, la ciudad de Buenos Aires y sus suburbios. In the study area, there is need for sewerage development and greater control of the practice of mining and mining. The Cd offered no risk in any of the analyzed points. It can be concluded that in the study area, there is need for sewerage development and greater control of the practice of mining and mining.
with different results. In the present work the uptake, bioconcentration and effects of Pb in Brassica naps was studied. A greenhouse experiment was conducted; single culture of B. naps was grown in a representative soil of the Pampas region with lead contamination incorporated at the start of the experiment. The tested concentrations were 0, 50, 100 and 200 mg kg-1 of Pb in soil. The dry weight of stems, roots, leaves and grains was taken at two ontogenetic stages; the results showed differences on the dry weight of stems at initiation of fruiting ontogenetic stage but not at the final maturity stage, and no significant differences were observed for grain production. In addition, lead accumulation in leaves — either senescent by effect of stress or harvested- and its effect on photo pigments was studied. At the initiation of fruiting stage, lead concentration in senescent leaves was significantly higher than in harvested leaves, and UV spectroscopy studies show differences in the production of photosynthetic pigments between plants grown on control soil and those grown with the higher concentration of Pb. Besides, at this stage the bioconcentration factor (BCF) of leaves decreased with increasing content of Pb in soil: BCF(50) > BCF(100) > BCF(200); this shows highest lead accumulation on leaves at lowest concentrations of lead in soils. All these results indicate a response to recent contamination of bioavailable lead in soil by Brassica naps, in aerial biomass and photosynthetic pigments; but we did not observed any effects on the production of grains or in growth parameters at the latest ontogenetic stage. This effect is attributable to evolution of Pb in soil towards more stable forms.

WP010. Determinación de la eficiencia de remoción de plomo y zinc por las especies Ludwigia peploides y Limnobium laevigatum

R. Fernández San Juan, Laboratorio de Toxicología; C.B. Albornoz, Cs Biológicas y Ecotoxicología; K. Larsen, Universidad Nacional del Centro de la Provincia de Buenos Aires / Cs Biológicas y Ecotoxicología; M. Quiroga, Universidad Nacional del Centro de la Provincia de Buenos Aires / Laboratorio de Análisis Biosoquímicos y Minerales; R. NAILE, Campus Universitario / Laboratorio de Ecotoxicología

En la actualidad, la problemática de la contaminación con metales pesados de aguas superficiales y subterráneas se ha incrementado debido al aumento de la actividad industrial y el necifaz tratamiento de sus efluentes. Debido a esto, durante los últimos años ha surgido la búsqueda de alternativas de saneamiento ecológicas y rentables, siendo la fitorremediación acuática uno de los métodos más estudiosos para la eliminación de metales en aguas contaminadas. En este trabajo se evaluó la eficiencia de remoción de metales pesados de las macrofitas flotantes Ludwigia peploides y Limnobium laevigatum, las cuales fueron seleccionadas para su estudio debido a que se encuentran ampliamente distribuidas en aguas superficiales de la ciudad de Tandil. Se realizaron ensayos en laboratorio en los cuales ambas especies fueron colocadas por separado en agua sin contaminar (controles) y en soluciones de Pb ([Pb] = 5 ppm), Zn ([Zn] = 20 ppm) y Pb + Zn ([Pb] = 5 ppm + [Zn] = 20 ppm). En todos los casos, se midió la concentración de cada metal en raíces, hojas y agua correspondientes a diferentes tiempos de exposición (1, 2 y 4 días). La determinación de los metales se realizó mediante la técnica de espectrotométrie de absorción atómica, E.A.A. GBC 906 (Australia). Limnobium laevigatum y Ludwigia peploides resultaron ser acumuladores de Pb y Zn, y presentaron altas eficiencias de remoción de los metales en función del tiempo, llegando a alcanzar valores de remoción de Zn del agua mayores al 96% luego de dos días de exposición, y valores de remoción de Pb mayores al 95% luego de cuatro días. Se presentaron diferencias significativas entre los diferentes ensayos, y los mayores valores de remoción se obtuvieron en los casos en que el Pb y el Zn no se encontraban combinados. Ambas especies presentaron mayor capacidad de acumulación de Zn en hojas que en raíces, mientras que en el caso del Pb la acumulación se dio principalmente en las raíces. Los resultados demostraron que tanto Limnobium laevigatum como Ludwigia peploides pueden resultar eficientes para la remoción de Pb y Zn en sistemas acuáticos.

WP011. Effects of copper sulfate exposure on biochemical and physiological biomarkers in juvenile freshwater fish Rhamdia quelen and Oreochromis niloticus

I.C. Guiausko, A.C. Boareto, Universidade Federal do Paraná / Farmacologia; E.P. Giareta, Universidade Federal do Paraná / Dept of Zoology; M.S. Rodrigues, UFPR / Farmacologia; C.A. Freire, Universidade Federal do Paraná / Fisiologia; H. Silva de Assis, UFPR / Pharmacology

The metals are an important class of water contaminants. The copper sulfate is a metal widely used to control diseases and parasites in fish farmers. In order to evaluate the effects of the copper on biochemical and physiological biomarkers, juvenile freshwater fish Rhamdia quelen and Oreochromis niloticus were exposed to three concentrations of copper: 2, 20 and 200 μg/L or water only for 96 h in a static bioassay. After exposure, the fish were anesthetized with benzocaine and euthanized for medial section and tissue removed to test neurotoxicity, oxidative stress and osmoregulation. The biochemical biomarkers as superoxide dismutase (SOD), catalase (CAT), glutathione S-transferase (GST) and lipoperoxidation (LPO) were analyzed in the liver. Acetylcholinesterase (ACHE) activity was analyzed in brain and muscle. Carbonic anhydrase (CA) was analyzed in gills. The results showed decrease in ACHE activity, both in the brain and in muscle, of R. quelen in 200 μg/L of copper. Acute exposure of copper in all concentrations evaluated in O. niloticus did not change ACHE. Hepatic SOD and GST activities in R. quelen increased after acute copper exposure to higher concentration (200 μg/L) when compared to the control group, whereas in CAT activity and LPO there was no significant difference among groups. In O. niloticus, copper increased SOD activity (200 μg/L) and also caused LPO (2 μg/L). Furthermore, GST activity was decreased in all copper concentrations. CA activity in R. quelen and O. niloticus was inhibited by copper at higher concentrations (20 and 200 μg/L). In R. quelen and O. niloticus copper induced increase in reactive oxygen species (ROS) and osmoregulatory disturbances. Copper exposure also caused neurotoxicity in R. quelen. The results of the present study suggested potential damaging impacts of copper, in juveniles of two fish species with economic and environmental importance.

WP012. Environmental reconstruction of a coastal lagoon. A case study of Itapeva Lagoon (RS), Brazil

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Most of the Brazilian population lives at coastal zones, which increases the anthropogenic pressure at these areas. In order to better understand the anthropic changes at Itapeva Lagoon (RS), the objective of this present work is to characterize the concentrations of heavy metals (Cd, Cu, Ni, Pb and Zn), arsenic and phosphorus in the sediments at Itapeva Lagoon (Brazil); calculate contamination indices as concentration factor (CF), enrichment factor (EF) and Pollution Load Index (PLI) at this site. The data was separated in three categories due to the area, and relate this values to recent geochronology. The determination of the elements concentrations is based on two methodologies: acid digestion of sediments with SW 846 US EPA 3050b method, and SW 846 US EPA 6010b method for analyses with Inductively Coupled Plasma-Atomic Emission Spectrometry. The core T3 showed higher concentrations for all elements, which increases the importance of Três Forquilhas river at this point. Particularly, at this same point is the maximum concentration factor (max CF = 156), concentration index (max CI = 101), enrichment index (max EF = 26) and Pollution Load Index (max PLI = 99) for all contamination indices. This fact may be associate with the use of pesticides that contained arsenic, that was normal at sugar cane plantations at time. Generally, the Itapeva Lagoon (Brazil) didn’t show contamination by the elements examined at this study, and can be used as a background region for then.

WP013. Estudio del efecto del Cd(II) sobre el crecimiento y la supervivencia de Physa acuta (Gasteropoda)

E. Balsamo, CIMIA Departamento de Química Facultad de Ciencias Exactas; G. Bulas Rossini, CIMIA Departamento de Química Facultad de Ciencias Exactas CIC; P.M. Demetrio, Center of Environmental Research / Departamento de Química; A. Ronco, Centro de Investigaciones del Medio Ambiente UNLP CONICET

El objetivo del presente trabajo fue el de evaluar el efecto del cadmio divalente a concentraciones subletales en el crecimiento de Physa acuta. La experiencia se llevó a cabo en condiciones de laboratorio (temperatura 20±2 ºC y fotoperíodo 16:8 horas luz: oscuridad) con animales de una semana de vida obtenidos a partir de puestas de una población que se mantiene en laboratorio. Los organismos se expusieron a siete concentraciones del contaminante (0.01 a 0.17 mg/L como Cd(II)) más un control negativo, todos por triplicado, consistiendo cada uno en un recipiente plástico de 0,3 litros con 0,2 litros de medio de cultivo y 10 ejemplares de la especie, con renovación tres veces por semana. Los individuos fueron alimentados ad libitum con lechuga fresca previamente lavada con agua de red con cada recambio de medio. Una vez por semana se midió largo máximo del caparazón de los ejemplares utilizando una lupa binocular y se contabilizó el número de animales presentes. Los resultados de longitud obtenidos, para 21 días de exposición, se analizaron a través de análisis de la varianza encontrando diferencias significativas para un a de 0,05 entre el control negativo y las
Heavy metals belong to a group of chemical elements, which has atomic number up to 20, which form part of the environment and living matter, and may also have macro features or essential micronutrients to living beings. Included on heavy metals group, zinc is an essential nutrient that contribute in the physiological processes for respiratory chain of living beings, besides to act as an enzyme cofactor for plants, mammals and microorganisms. On the other hand, if the concentration of element used are greater than the required for living beings, the zinc presence may affect negatively this environment, showed that concentration of the chemical element are important to define the toxicity. In this study, the aim was evaluating the acute toxicity of zinc to juvenile Folsomia Candida, incorporated in two kinds of tropical soils, clay and sandy, and an artificial tropical soil (TAS). The TAS was prepare with sand, kaolin and coconut fiber, in a proportion of 7:2:1 (w:w:w), respectively. The tropical soils were collected in agrochemicals free areas. For the F. candida acute toxicity tests were performed using glass jars containing 30 g of sample, 10 juveniles 10-12 days old and 2 mg dry yeast, with eight concentration, which were 0; 112.5; 225; 450; 900; 1800; 3600 and 7200 mg kg-1 by five replicates. The test was raining by 14 days in order to determine the organism mortality. Other parameters, i. e., pH, particle size, organic matter, phosphorus, potassium, calcium, magnesium, aluminum, boron, copper, iron, manganese, zinc, sum of exchangeable bases and cation exchange capacity, also were determined in this tropical soils. The sand soil properties were 895 kg t-1 of total sand, pH of 3.9 and 0.5 mg dm-3 of zinc and the clay soil properties were 295 kg t-1 of total sand, pH 4.1 and 0.8 mg dm-3 of zinc. The mortality rates on the highest concentration of zinc were 88% for sandy soil, 44% for clay soil and 46% for artificial soil. The lower mortality was detected in the clay soil, that has smaller particle that probable help to retain zinc in the soil and decreased the zinc offer for the organism. Similar assumption was inferred to the SAT soil mortality, that present 10% of organic matter.

WP017. Geoaccumulation of Pb and Zn in the last 100 years in Londrina city, Southern Brazil.
L. Vieira, Universidade Tecnológica Federal do Paraná / Engenharia Ambiental; S. Froehner, Federal University of Paraná / Department of Environmental Engineering; J. Sanez, Universidade Federal do Paraná / DHE
The bottom sediments of aquatic environments located in urban areas and big cities have predisposed the accumulation of trace elements, they are susceptible to metal pollution from various sources including industrial waste, vehicle emissions and other activities in.

WP018. Levels of Cd, Hg and Pb in tissues of blue crabs Callinectes danae from a subtropical protected estuary influenced by mining residues.
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The Ribeira de Iguape River (RIR) forms the main hydrographic basin that contributes to the Cananéia-Iguape-Peruíbe estuarine complex (CIP). Although mining and metallurgy activities have been closed, their influence can still be observed in the RIR and in the CIP estuarine complex, as slags and tailing piles were deposited on the river banks. Organisms can be used as biomonitoring of evaluate environmental contaminants. However, they use requires an understanding of uptake processes, including the main pathways and the internal regulatory mechanisms. Blue crabs of the genus Callinectes have been used as environmental biomonitor. This study aimed to evaluate Cd, Hg and Pb concentrations in tissues of blue crab Callinectes danae from the CIP region. In October 2014, blue crabs were collected in the South portion of CIP. All organisms were collected at the intermolt stage in order to minimize the effects of lower or upper concentrations during pre-molt and molt stages. The species and sex were identified. The maturation stage due to the shape and degree of
adherencia del abdomen a los escaños torácicos, en tumorables, carapace length and width were also measured. Muscles, hepatopancreas and gills were removed by dissection. Pb and Cd concentration were determined by graphite furnace atomic absorption spectroscopy (GF-AAS). In particular, Hg concentration was determined using cold vapor generation (CV-AAS). Certified reference material (NIST 1566 b -Oyster tissue) was used for analytical methodology validation in terms of precision and accuracy. Kruskal-Wallis (H) and Mann Whitney (Cd) tests were applied to compare the metal concentrations among different tissues. Pb and Cd median concentrations in gills were higher than those found in muscles and hepatopancreas, respectively. It was not detected any differences between Hg results. The obtained concentrations were in ppb magnitude (ng g⁻¹), except Cd concentrations in hepatopancreas and some results for Pb in gills, which were higher than the Brazilian legislation limits (Cd and Pb=0.5 µg g⁻¹). We concluded that Callinectes danae from CIP is not contaminated, however new efforts to monitor Cd concentrations must be performed.

WP019. Metallothionein, trace-elements and methylmercury in hard and soft tissues of Spheneus magellanicus found stranded on the Southern Brazilian coast
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Magellanic penguins (Spheniscus magellanicus (Forster, 1781)) are the most abundant species on the coast of South America. They have been reported as good biomarkers for several types of pollutants, including trace-elements. In this context, selenium (Se), total mercury (Hg), methylmercury (MeHg), inorganic mercury (Hgino), cadmium (Cd) and lead (Pb), as well as metallothionein (MT) levels, were evaluated in the feathers, liver and kidney of juvenile Magellanic penguins found stranded along the coast of Southern Brazil. Hg was determined by cold vapor atomic absorption spectrometry, using NaH4H as a reducing agent. Se, Pb and Cd were determined by graphite furnace atomic absorption spectrometry, using palladium nitrate as chemical modifier. MeHg was identified and quantified in the toluene layer on a Shimadzu gas chromatograph GC-14 with an electron-capture detector-EC. The values corresponding to the concentrations of Hginor were calculated as the difference between the values found for Hg and Hgino concentrations. MTs were quantified using a spectrophotometric method at 412 nm. Magellanic penguins presented low concentrations in the hard and soft tissues, which were comparable to those found in previous studies with this seabird. The highest concentrations of all trace-elements and MeHg were found in soft tissues. Concentrations of Cd and Se in feathers were extremely low in comparison with their concentrations in soft tissues. The results showed that in Callinectes Wallis (Ph and Hg) and Southern Portions of Iguape (Cd, Pb and Hginor), as well as in the detoxification of MeHg. MT has also showed to play a role in the detoxification of trace-elements and Hginor, with the exception of MeHg, in the liver of Magellanic penguins.

WP020. Prospección de hongos filamentosos resistentes a metales pesados
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El incremento de las actividades relacionadas a la industria del cemento, colorantes, curtiembres, fertilizantes, materiales fotográficos, pinturas anticorrosivas y, en mayor medida la minería, constituyen mayores fuentes de contaminación de los suelos con crono trivalente y hexavalente. Este tipo de contaminación tiene un impacto directo sobre el ambiente y afecta, de forma indirecta, a la biota. Existen diversas estrategias para el tratamiento de metales pesados, siendo la más común la precipitación, sin embargo muchas veces son incompletas en su remoción y/o resultan económicamente inviables. La utilización de microorganismos como una alternativa potencial para la remoción y reciclaje es una opción cada vez más atractiva. En este contexto, se buscó el metabolismo de crecer en el medio (6 WRF y 7 LDF). De cada grupo de hongos, se seleccionaron las dos cepas con mayor CE50 para evaluar el efecto protector del ácido vanílico sobre el crecimiento del hongo. Paralelamente, se observó un incremento en la actividad enzimática de las enzimas de los hongos en presencia del metal.

WP021. Responses of metallothioneins in tissues of bullfrog tadpoles, Lithobates catesbeianus, following exposure to the metals zinc, copper and cadmium
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Metallothioneins (MTs) play a key role in the cellular protection against toxic metals and against environmental stress. The objective of this study was to examine the effects of isolated and combined metals (Zn/Cu and Cd - at 1 µg L⁻¹) in the liver, kidney and muscle of bullfrog tadpoles, Lithobates catesbeianus, exposed during 2 and 16 days. MT levels in the liver and the muscle decreased after 2 days in the groups exposed to Zn, Cu, Zn+Cu and Zn+Cu+Cd. In the kidney, MT levels decreased in the groups exposed to Zn and Cd, and increased in the muscle in the groups exposed to Zn and Cu after 2 days. After 16 it was observed an increase in MTs in the liver, muscle and kidney after exposure to Zn, Cu, Zn+Cu, Zn+Cd, Cu+Cd, and Zn+Cu+Cd. Therefore, the binding of MTs to the accumulated metals seems to represent a strategy developed by the species to promote detoxification. However, comparing MT levels between animals exposed isolated metals, it was observed a decrease in its levels after 16 days of exposure when compared to controls exposed to 2 days. In contrast, in the groups exposed to combined metals (Zn/Cu, Zn+Cd), the levels of MT in the muscle were higher after 16 days of exposure, when compared to the group exposed during 2 days. Indeed, MT levels increased in the kidney of the groups exposed to Zn and Cu, but decreased in the groups exposed to Cd during 16days compared to the groups exposed during only 2 days. After 16 days, the concentration of MTs accumulated in the tadpoles' tissues was much higher in response to the exposure to the combined metals than those observed for the essential metals Cu and Zn. This seems to confirm that tadpoles have mechanisms to regulate (at least to a certain extent) the uptake and/or excretion of essential and non-essential metals. Financial support: FAPESP Proc. 507523/2011.
Positive correlations between metals were obtained indicating that probably have the same sources. The increase of the concentrations toward Iguaque highlights the influence of mining activities and the importance of the drainage made by the river, confirming that the input of these elements still persists, by the contribution of the tailings piles kept on its banks. Additionally, the bioavailability and toxicity of the sediments in the southern portion is revealed, highlighting its potential contribution to the biota in both areas. This study contributes to the formation of an integrated assessment, joining the data on the analysis of water, sediment and biomarkers, collaborating to the monitoring of environmental quality and contamination of the local biota.

WP023. Study of peat as chemical and toxicological remediation of lead and nickel metals in aquatic environments
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Introduction: The supply of metals in water bodies can negatively impact the local biota, with possibility of bioaccumulation up and biomagnification in the food chain, and can affect humans. Thus, characterizing the interactions between metals and peat (with potential for treatment) can lead to important information related to the availability of such pollutants on aquatic biota. Objectives: 1. To assess the adsorptive capacity of peat on the metals lead and nickel, through quantitative analysis; 2. Check if the quantitative reduction of metals in peat involves the reduction of the toxicity of these metals, using the toxicity test with Ceriodyphnia dubia species. Methodology: The study to evaluate the adsorption capacity was carried out from solutions of metals Pb and Ni, at concentrations between 1 and 20 mg.L⁻¹, pH 4.5. Each solution received 0.5 g.L⁻¹ of peat, followed by stirring for 1 hour at 130 rpm. Subsequently, the solutions were filtered in an ultrafiltration tangential flow system with polyethersulfone membrane of 1kDa at predetermined times. Aliquots of 2 ml were withdrawn, and the concentration of metals was determined by ICP-OES. The ecotoxicological trials took place exposing the organisms to a solution with a concentration of 1 mg.L⁻¹ of metal, with or without peat (5 g L⁻¹), and two control solutions, one with cultivation water with peat and other one without (5 g L⁻¹), based on standard NBR 13373 (2011). They were then filtered through a cellulose nitrate membrane with porosity of 0.45µm, subsequently adjusting the pH. Through Toxstat 3.5 software (EDT, 1996) statistical analysis were performed of Bonferroni t-test (reproduction parameters) and the Kruskal-Wallis test (mortality) to ascertain the toxicity of the metal before and after treatment. Results: In adsorption tests, it was necessary 15 to 60 15 minutes to achieve equilibrium between peat and Pb and Ni, respectively, with 100% retention for both metals. Acute toxicity was observed in only 48 hours of exposure containing metals, becoming chronic toxicity after treatment with peat. Conclusion: Although peat proved to be an excellent adsorbent for both metals, indicating their chronic toxicity to organisms-test. This fact is probably related to its marine origin. It is necessary to test peat with other origins in order to maintain a viable treatment for removal of metals, without prejudice to the freshwater biota.

WP024. Trace metal bioavailability in beaches from the Rio de la Plata estuary
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Polychaetes worms are key organisms in estuarine ecosystems, being an important prey item to coastal community (e.g. fish, crustaceans and sea birds). The nereidid Laeonereis acuta, is a deposit feeder that lives in the intertidal area of estuaries along the Atlantic coast of South America. Ragworms accumulate metals from sediment and may represent a means of entry of contaminants to the trophic network. In this work, the concentration of five metals (Zn, Pb, Cu, Cr and Cd) was determined in polychaetes and sediments (total and bioavailable) from six estuarine beaches of the Rio de la Plata with different levels of anthropic impact. Sediments were digested with HF (total) or HCl 1N (bioavailable) and subsequently the solutions were filtered in an ultrafiltration tangential flow system with polyethersulfone membrane of 1kDa at predetermined times. Aliquots of 2 ml were withdrawn, and the concentration of metals was determined by ICP-OES. The most abundant metal was Zn in L. acuta as well as sediment, contrary to Cd, the least abundant. Cu and Zn were generally bioaccumulated by L. acuta according to the biota-sediment accumulation factors calculated. High levels of non-essential metals such as Pb indicate coastal contamination. The high association between metals in sediment and polychaetes, denotes the role of L. acuta as an important link in metal trophic transfer from sediments to fish and birds.

WP025. Trace metals in two mussel species Mytilus galloprovincialis and Perna perna on the south coast of South Africa
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Witsands, on the south coast of South Africa, is a popular seaside destination close to the Breede River, the effect of increasing human activity in this area is unknown. Mussels are commonly used as indicators of pollution in the environment, however the historical data from the musselwatch programme of South Africa has not always identified which species of mussel was used. Therefore, sampling of Perna perna (brown mussel) and Mytilus galloprovincialis (Mediterranean mussel), sediment and water took place at three sites, Witsands, Infanta and Witsands harbour in August 2013 and February 2014 to determine whether these two species accumulated trace metals differently and whether temporal differences occur. The brown mussel was absent from the harbor. Almost all of the trace metals in the sediment and water closest to the Witsand harbour were higher than the other two sites. The concentration of trace metals in the Mediterranean mussel tissue was found to be generally higher than that of the brown mussel. However, some metals were higher in the brown mussel, indicating that these mussel species differ in their accumulation of different metals. The temporal differences were not marked. Implications for monitoring are therefore that, one species should be decided on for collection in order to standardize results and make them comparable.

WP026. Trophic transfer of zinc in the food chains of native and non-native predator fish from a northern Patagonian oligotrophic lake
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Zinc (Zn) is an essential element that is carefully regulated by physiological mechanisms in most organisms. Thus, bioaccumulation of Zn and its flow through food webs should not be analyzed and interpreted in the same context as non-essential elements. In aquatic systems, food is often the major exposure route of metals to animals. In this sense, the aim of this work was to assess the trophic transfer of Zn, in simplified food chains of introduced and native fish top predators, in the northernmost area of Lake Nahuel Huapi, the largest oligotrophic system in North Patagonia Andean Range, Argentina. Zinc concentrations [Zn] and stable nitrogen isotopes (δ15N) were determined in three plankton fractions (P1: 10-50 µm, P2: 50-200 µm, P3: >200 µm), in a planktivorous native fish (the small puyen Galaxias maculatus), in a benthivorous native fish (Semotilus sp.), in a benthivorous native fish (Semotilus sp.), in two introduced salmonids (rainbow trout Oncorhynchus mykiss and brown trout Salmo trutta) and in a native fish (creole perch Percichthys trucha). Samples were obtained at Brazo Rincón in Lake Nahuel Huapi. Zinc concentrations were determined by Instrumental Neutron Activation Analysis and δ15N, as an estimator of trophic level, were assessed by Isotope Ratio Mass Spectrometry. To describe trophic transfer patterns of Zn in the food chains of predator fish (salmonids and creole perch), the relationship of δ15N and log10-transformed [Zn] was analyzed for each sampled item. The highest [Zn] were recorded in pelagic primary producers (P1) ranging from 960 to 5070 µg g⁻¹ dry weight (DW) and in rotifers and mixtrophic ciliates (P2, 187-2712 µg g⁻¹ DW), followed by G. maculatus (176-432 µg g⁻¹ DW), cladocerans and copepods (P3, 85-258 µg g⁻¹ DW), and S. spinors (68.4-174 µg g⁻¹ DW). Lower [Zn] were recorded in top predator fish. The native creole perch showed [Zn] between 20 and 92 µg g⁻¹ DW, while the lowest [Zn] were found in salmonid muscle, ranging from 12 to 18 µg g⁻¹ DW for O. mykiss, and 12.3 to 18.2 µg g⁻¹ DW for S. trutta. A decrease in [Zn] from lower to higher trophic levels was observed.

WP027. Valoración del Riesgo Ambiental Ocasionado por la Contaminación con Metales Pesados en Sedimentos y Peces en las Costas del Mar Caribe Colombiano
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En este trabajo se analizaron sedimentos y músculo dorsal de peces colectados a lo largo de la costa Caribe Colombiana en sitios como el Golfo de Morrosquillo, las Bahías de Cartagena y Santa Marta, Río Magdalena y las playas de Riohacha para medir el grado de contaminación con los metales pesados Cd, Ni, Pb y Zn mediante espectrometría de absorción atómica de llama y horno de grafito. La salinidad, pH y oxígeno disuelto se midieron in situ en cada estación de muestreo.

Las muestras fueron fosilizadas y después de una digestión fuerte se determinó la concentración total de los metales. Los peces fueron identificados morfológicamente y su nivel trófico determinado. La repetitividad de los análisis fue menor del 2% y la exactitud entre 96 y 105%, la última calculada con muestras certificadas o por adición de estándares. Las concentraciones metálicas en peces y sedimentos siguieron el orden: Zn > Ni > Pb > Cd. Los rangos de concentración metálica en músculo de peces fueron ND-5.3 (Cd), ND-500 (Ni), y 10-110 (Pb) mg/Kg y 0.33-3.9 mg/Kg (Zn) y en sedimentos 0.01-0.42 (Cd), 8.4-25 (Ni), 0.4-7.0 (Pb) y 9.3-199 (Zn) mg/Kg en la región muestreada. Las concentraciones encontradas en músculo de peces y sedimentos fueron bajas en comparación con las reportadas en otras regiones del mundo y las máximas establecidas por organismos de control internacionales por lo que el riesgo de contaminación con estos metales en seres humanos por consumo de pescado de la Costa Caribe colombiana fue bajo; el índice de riesgo promedio para todas las estaciones de este estudio fue muy bajo, 0,043; sin embargo, algunos datos que se usan para hacer estos cálculos tienen incertidumbres de hasta un orden de magnitud por lo que los índices de riesgo podrían ser más de diez veces mayores que los calculados. Por otro lado, la sumatoria de los HI para todos los metales ya tiene un valor apreciable, 0,33, por lo que no se descarta que se pueda sobresopar el índice de riesgo de 1 cuando se consideren otros metales y contaminantes. Estos resultados se explican debido a que la mayoría de peces fueron colectados en mar abierto lejos de las zonas contaminadas de la Costa Caribe.

WP028. Vegetal species composition, distribution and abundance of a region affected by gold mine environmental liabilities

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Metal mining and especially gold mining represents important economic activities in South-America. It is known that mining activities may generate environmental liabilities due to unplanned disposal of residues, affecting different components of a given ecosystem. Changes on pedological conditions induce responses on native vegetation that can be quantified by different parameters. In this sense, the aim of the present work was to evaluate floral composition, distribution and abundance of vegetal species as a baseline to determine the relationship between vegetation and gold mine environmental liabilities in an area located at the northeast of San Juan province (Argentina). On base of visual interpretation of a Landsat 8 image using QGIS, the study area was divided into three subunits: Upstream, Downstream and Inhabited area. On each subunit a combined sampling was performed. Transects and squares were performed to quantify different variables. Transects were 50 m long and randomly distributed. The number of transects was calculated as N≥[(ds.T)/(1-p)]/2. Squares had 4 m2 and were realized every 10 m. Floral diversity was calculated by Shannon and Simpson indexes. Results shown that upstream subunit was the most diverse followed by downstream and inhabited area (Shannon index: 0.07, 0.05 and 0.02 respectively). Upstream subunit was also the less dominant followed by downstream and inhabited area (Simpson index: 0.002, 0.01 and 0.01 respectively). In agreement with index results, richness analysis indicated that inhabited area presented the lower value (25, 21 and 13 species in upstream, downstream and inhabited area respectively). Finally, regarding to density of species, Aristida mendocina was the densest in all subunits evaluated, presenting values of 5.60, 2.69 and 2.15 individuals/m2 in upstream, downstream and inhabited area respectively. Strikingly, A. mendocina was significantly reduced in downstream and inhabited sector. Taking together the obtained results suggest that vegetation presents variations on floral diversity, distribution and abundance of species among different subunits evaluated. Undoubtedly, further research is necessary to understand these variations are related to changes in pedological conditions induced by the abandoned gold mine environmental liabilities.

WP029. Zinc effects on ionic parameters and carbonic anhydrase activity in the Neotropical teleost Prochilodus lineatus

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Zinc (Zn) is an essential element for living organisms, but at high concentrations it can become toxic. The main zinc anthropogenic sources are mining, galvanizing processes, manufacturing alloys, burning fossil fuels, garbage disposal and fertilizers and pesticides. In order to better understand the effects of this metal on fish this work was designed to evaluate zinc effects on osmoregulatory parameters of the freshwater fish Prochilodus lineatus. For this, juveniles of P. lineatus provided by the Hatchery Station of the University (UEL) were acclimated for 5 days in the laboratory, under constant aeration and temperature. Then, fish were exposed, for 96 h, to three Zn concentrations: 0.18 mg L-1 (Zn 0.18), 1.0 mg L-1 (Zn 1) and 5.0 mg L-1 (Zn 5) or only to water (CTR). After exposure, animals were anesthetized for blood sampling and plasma was used for the determination of osmolality and the concentrations of Cl-, Na+, K+, Ca2+. Moreover, fish were killed and gills were removed and used for the analysis of carbonic anhydrase activity (CA). Among all the ions analyzed, only Na+ showed a significant decrease in Zn 5 (p=0.019), when compared to CTR. The concentration of Cl- in animals of group Zn 5 was significantly lower (p=0.012) when compared to Zn 1. AC activity of group Zn 1 was lower (p=0.035) in comparison to CTR, but at higher concentration (in Zn 5) this levels of pollutants. Lead is toxic for being a non-essential nutrient element and because this metal can be biomagnified through the trophic chain. We reviewed the Pb levels (dry weight) in different species of gulls, depending on the biological matrix analyzed and the geographical location. The highest Pb concentrations were reported in Larus carchinans (25.96 ± 19.49 µg/g, n=20), whereas the lowest levels were in Larus atricilla (0.0026 ± 0.00024 µg/g, n=10). The highest Pb concentrations were reported in excrta (39.9 µg/g, n=13), and the lowest in the gallbladder (0.03 µg/g, n=5). With regard to the geographic location, the higher and lower Pb concentrations were reported in the Southern Hemisphere (3.184 ± 2.41 µg/g, n=187) and in the Northern Hemisphere (2.32 ± 1.68 µg/g, n = 2337), respectively. According to metal distribution in gull matrices, the Pb levels are as follows: excreta > stomach contents > bones > lung > brain > feathers > kidney > liver > eggs > muscle > eyeball > salt gland > blood > gonads > heart > pancreas > skin > stomach > uroepigal gland > subcutaneous fat > intestine > gallbladder. High Pb levels in excrta may correspond to detoxification processes. Since most of the data at global scale are from Northern Hemisphere, future studies should be conducted in gulls from Southern Hemisphere. The gull feathers can be a good biological matrix for monitoring Pb. Standardized methodology for Pb detection in excreta is quite needed in order to compare data at global scale. Acknowledgements: Winfred E. Espejo is scholarship CONICYT-Chile for PhD studies. This study was financially supported by FONDECYT-Chile 1140466 granted to R. Barra and FONDECYT 1140164.

Pollution in Protected Areas: Challenges and Opportunities in Protecting Biodiversity and Ecosystems

WP030. Lead in gulls: A global overview

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Gulls are birds that are present in most aquatic and terrestrial ecosystems. These birds are excellent bio-indicators of anthropogenic pollution, because they are opportunistic, omnivores and coexist with the man. They are particularly important to assess the ecosystem’s health and can reflect the environmental levels of pollutants. Lead is toxic for being a non-essential nutrient element and because this metal can be biomagnified through the trophic chain. We reviewed the Pb levels (dry weight) in different species of gulls, depending on the biological matrix analyzed and the geographical location. The highest Pb concentrations were reported in Larus carchinans (25.96 ± 19.49 µg/g, n=20), whereas the lowest levels were in Larus atricilla (0.0026 ± 0.00024 µg/g, n=10). The highest Pb concentrations were reported in excrta (39.9 µg/g, n=13), and the lowest in the gallbladder (0.03 µg/g, n=5). With regard to the geographic location, the higher and lower Pb concentrations were reported in the Southern Hemisphere (3.184 ± 2.41 µg/g, n=187) and in the Northern Hemisphere (2.32 ± 1.68 µg/g, n = 2337), respectively. According to metal distribution in gull matrices, the Pb levels are as follows: excreta > stomach contents > bones > lung > brain > feathers > kidney > liver > eggs > muscle > eyeball > salt gland > blood > gonads > heart > pancreas > skin > stomach > uroepigal gland > subcutaneous fat > intestine > gallbladder. High Pb levels in excrta may correspond to detoxification processes. Since most of the data at global scale are from Northern Hemisphere, future studies should be conducted in gulls from Southern Hemisphere. The gull feathers can be a good biological matrix for monitoring Pb. Standardized methodology for Pb detection in excreta is quite needed in order to compare data at global scale. Acknowledgements: Winfred E. Espejo is scholarship CONICYT-Chile for PhD studies. This study was financially supported by FONDECYT-Chile 1140466 granted to R. Barra and FONDECYT 1140164.

Ecological Risk Assessment of Pharmaceuticals and Personal Care Products (PPCPs) in Aquatic Environments

WP031. Alterations in hematological parameters of a freshwater fish Rhamdia quelen after short and long-term exposure to diclofenac

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Triclosan is an antibacterial compound widely used in personal care products and a potential aquatic contaminant, since several studies reported relevant concentrations of triclosan in rivers of various locations around the world. Considering the negative effects of triclosan on the aquatic biota and the scarcity of ecotoxicological studies with Neotropical species, the objective of this study was to evaluate the effects of triclosan on biotransformation enzymes, antioxidants defenses and the occurrence of oxidative and DNA damage in a Neotropical fish after 24 h of exposure. Juveniles of Prochilodus lineatus (n = 35; 18.7 ± 4.5 g) were divided in 5 groups (n = 7 in each) and were transferred to glass aquaria containing 80 L of only dechlorinated water (CTR) or water containing 0.3 μg L⁻¹ (TCS 3), 3 μg L⁻¹ (TCS 3), 30 μg L⁻¹ (TCS 30) of triclosan or methanol at 0.3 μg L⁻¹ (MET) as the solvent control. After 24 h exposure, animals were anesthetized, for blood sampling, and killed, for the removal of the liver. Blood was used in the comet assay to assess DNA damage. Liver was homogenized, centrifuged and the supernatant was used for the analyzes of the activity of the biotransformation enzymes ethoxysresorufin-O-deethylase (EROD) and glutathione S-transferase (GST), the antioxidant enzymes superoxide dismutase (SOD), glutathione peroxidase (GPx), glutathione reductase (GR) and catalase (CAT), the content of glutathione (GSH) and the occurrence of lipid peroxidation (LPO) and protein carbonylation (PCO). Results of each parameter were compared among the groups (CTR, MET, TCS 0.3, TCS 3, TCS 30) using analysis of variance (ANOVA) and the differences localized by multiple comparison (SNK) test. Despite the toxic effects of triclosan had already been shown on many aquatic species, in this study the biomarkers analyzed did not indicate any significant effect of this biocide. Studies with long term exposure period for a better understanding of triclosan effects on P. lineatus, since fish exposed to triclosan for 24 h showed a decreasing trend in the biotransformation enzymes together with an increase in oxidative damage.

WP034. Characterization of polybrominated flame retardants (PBDE’s) in waste materials from landfills located in Mexico City Metropolitan Area

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While polybrominated diphenyl ethers (PBDEs) are intended to be beneficial when used as flame-retardant additives in many polymers and resins; studies have indicated their adverse effects on humans and the environment, including from bioaccumulation [Mizukawa et al, 2009] and persistence, even in remote regions like the arctic and thus are subject to long range transport [De Wit et al, 2010], to toxicity [Verner et al., 2011], especially in the case of the lower brominated congeners. One of the ways PBDEs are released to the environment is through waste disposal sites. In Mexico, the municipal solid waste is disposed in solid waste landfills, controlled dumps and open dumps; the leaching from these disposal sites is thought to be a major pathway for PBDEs release to the environment [Kwan et al, 2013]. Thus, the determination of PBDE congeners in different waste materials E&E parts, electrical conduit, upholstered furniture and automotive parts, from landfills using microwave-assisted extraction (MAE) and gas chromatography-mass spectrometry (GC-MS-SIM) was developed. Different extraction parameters (type of solvent, extraction time and quantity of sample) were optimized as first step. Solvent mixtures with different polar nature such as isopropanol/methanol (1:1 v/v) and isopropanol/n-hexane (1:1 v/v) were considered. The extraction time, from 5 to 10 min, was optimized using both solvent systems. The sample quantity was optimized from 0.25 to 0.5 g. For textile samples, the optimized parameters were as follows: extractant mixture isopropanol/methanol, 0.5 g of sample during 10 min. For plastic samples, the parameters were as follows: extractant mixture isopropanol/n-hexane, 0.5 g of sample during 10 min. In both types of samples, the congener BDE-28 (2,4,4'tribDE) was found in greatest concentrations due to a probable degradation of higher congeners. References De Wit et al, 2010. BRF in the Arctic Environment: trends and new candidates. Sci of Total Env, 408. Kwan et al, 2013. PBDEs in leachates from municipal solid waste dumping sites in tropical Asian countries: phase distribution and debromination. Envi Sci Pollut. Res. 20, Mizukawa et al. 2009. Bioconcentration and biomagnification of PBDEs through trophic level. Envi Sci Pollut. Res. 18, 58. Gavrill, 58. Bene et al, 2011. In vitro neurotoxicity data in human risk assessment of PBDEs: Overview and perspectives. Toxicology in Vitro, 25.
Los contaminantes emergentes son compuestos de distinto origen y naturaleza química cuya presencia en el medio ambiente ha pasado inadvertida, consecuentemente en la actualidad se vienen realizando investigaciones relacionadas con estrategias de tratamiento para su remoción. Entre éstos, se sabe que los fármacos y productos de cuidado personal, también conocidos como PPCPs son principalmente incorporados al ambiente vía aguas servidas, no siendo eficientemente removidos en las plantas depuradoras, alcanzando las aguas superficiales y sistemas de potabilización. La tecnología de adsorción con un carbón activado presentan gran potencial en la remoción de trazas de contaminantes emergentes. La predicción de la velocidad a la que la adsorción se lleva a cabo para un sistema dado es probablemente el factor más importante en los sistemas de diseño basados en esta tecnología. Se analizan en este trabajo resultados de estudios de equilibrio y cinética de adsorción de PPCP sobre carbón activado con un área superficial de 956 m2/g y tamaño de poro de 20 Å. En función de estudios previos se seleccionaron en particular la carbazemepina (Cbz) y el metilparaben (Mp) como representativos. Se emplearon 100mg/L de adsorbente en soluciones con diversas concentraciones de Cbz y Mp en un intervalo de 24 a 240 mg/L bajo agitación continua de 90 rpm. El seguimiento del proceso de adsorción se realizó por método espectrofotométrico a 285nm y 256nm para Cbz y Mp, respectivamente. La cinética se analizó utilizando ecuaciones de pseudo primer y pseudo segundo orden. Las isotermas se estudian con los modelos planteados por Langmuir y Freundlich. El equilibrio para el Mp se alcanza a las 16h.m. mientras que la Cbz a 312h. Ambos compuestos se ajustaron al modelo cinético de pseudo primer orden y las isotermas se ajustaron al modelo de Langmuir con altos coeficientes de correlación. La capacidad máxima de adsorción del carbón activado para los compuestos fue cercana a 200mgPPCP/gC. Se concluyó que ambos compuestos se ajustan a los mismos modelos tanto de cinética como en las isotermas, siguiendo un comportamiento de adsorción en monocapa. El Mp presentó mayor velocidad de adsorción y menor energía de ligadura de adsorción que la Cbz. El potencial uso de los carbones en tecnologías de remoción a escala real requerirá de investigaciones ulteriores, teniendo en cuenta materiales funcionales con una cinética más apropiada para estas aplicaciones.

WP036. Ecotoxicological monitoring of leachate and domestic wastewater remediation in an in series biological treatment system


Today the increasing demand for water favors that many scientific studies to develop processes to treat properly different aqueous matrices. In this sense, separately, different biological processes may present some limitations, however associated form can be an effective tool for the treatment of high complexity aqueous matrix as is the case of leachate and domestic wastewaters. Thus, the aim of this study is to evaluate the ecotoxicity of influent (composed by 10% leachate and 90% domestic wastewaters) and effluent treated by an in series biological treatment system, using two different organisms test: brine shrimp microcrustacean (Artemia salina) and lettuce seeds (Lactuca sativa). In microcrustacean bioassay samples will be considered toxic if the mortality rate exceeds 50% and, for lettuce seeds, phytotoxicity of samples was performed by determining the root Average Relative Growth Index and Germination Index. Influent (IS) and effluent (ES) samples analyzed were collected, monthly from Aug./2014 to Apr./2015. The results obtained for the IS, in both samples studied demonstrated that the IS samples in Aug. and Sept. and ES in Sept. showed a high toxicity. Since ES sample in Sept. reduced toxicity in approximately 37.5%. In the further months (Oct.-Apr.), both samples showed a very slight toxicity compared to previous months. This reduction could indicated the efficiency of the treatment system studied. In addition, for both samples, L. sativa tests showed a significant inhibition of root growth and necrosis in Aug. and Sept. Additionally, in Oct. IS sample showed a stimulation of root growth compared to the negative control. Already from Nov to Mar., IS samples showed no significant effects, since the ES samples presented inhibition of root growth and in Apr., IS and ES samples indicated the stimulation of root growth compared to the negative control.

WP037. Ecotoxicological Study and Environmental Risk Assessment of the antimicrobial compound Triclosan in marine environment

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The antimicrobial triclosan (TCS) is widely used in many kinds of industrial products, such as toothpaste, facial cream, shampoo, soaps, deodorants, foodstuff packaging, adhesives, toys, and others. Although TCS has been detected in effluents from sewage treatment plants, as well as in water and sediment of freshwater, estuarine, and marine environments, its adverse biological effects and environmental risk need to be better understood. This study assessed cytotoxic effects of TCS to the marine bivalve Perna perna, as well as chronic effects of TCS on the reproduction of Perna perna, the sea urchin Lytechinus variegatus, and the copepod Nitokra sp. The environmental risk of the compound was estimated through the tiered framework proposed by the Directive EMEA/CHMP/SWP/44177/00. The no-observed-effect-concentration (NOEC) determined in the current study, and the environmental concentration of 310ng L-1 previously reported for TCS for coastal areas. TCS is classified as “low risk” (RQ < 0.1) when only the chronic standard tests are considered. However, if the environmental risk is estimated using the NOEC determined from the cytotoxicity assay, which specifically considers the mechanism of action of TCS and with longer exposure time, TCS is classified as a “high risk” (RQ >1) compound in marine environments.

WP038. Effects of Peracetic Acid disinfectant on Daphnia magna

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Peracetic acid (PAA) is a strong oxidant and disinfectant. PAA is commercially available in the form of a quaternary equilibrium mixture containing: acetic acid (AA), hydrogen peroxide (HP), PAA and water. Due to its bactericidal, virucidal, fungicidal, and sporcidal effectiveness as demonstrated in various industries, the use of peracetic acid as a disinfectant for wastewater effluents has been drawing more attention in recent years. Some of the desirable attributes of commercial PAA are the ease of implementing treatment, small dependence of pH and the absence of production of significant amounts of toxic, mutagenic DBPs or chemical residual byproducts into effluents. The toxicant of peracetic acid can be explained by its oxidant activity. This oxidant activity and that of hydrogen peroxide can generate free radicals leading to oxidative stress in aquatic organisms. The hydroxyl radical activity of peracetic acid is lethal for bacteria and could be lethal for other organisms. The toxic potential of commercial peracetic acid, used also in the disinfection of urban wastewater, was evaluated with respect to an aquatic organism. Disinfection assays were carried out with freshwater from the city of Santa Fe (Argentina), and subsequently, toxicity bioassays were applied in order to verify possible adverse effects to the cladocerans (Daphnia magna). Daphnia magna was used due to its biology (reproduction by partenogenesis which permits maintaining and breeding in the laboratory) and also because it is a zooplankton and thus a very important link in the freshwater food chain. Another reason for this choice was that this microcrustacean is quite sensitive to pollutants in comparison to other freshwater invertebrates. Lastly, Daphnia seemed to be a good tool for our study since it is sensitive to detergents and disinfectant-detergent mixtures. The EC50 24–48 h (efficient concentration that immobiles 50% of Daphnia after 24–48 h) were determined using Litchfield and Wilcoxon’s statistical method known as the “probit method” where the LC/EC50 obtained was 0.466 mg/L of commercial peracetic acid. It would be interesting to complete this study with additional analyses. Indeed, the concentrations studied during an acute toxicity test and/or when the EC50 is calculated are far from environmental doses. Chronic toxicity tests at 21 days would permit studying the growth and reproduction of the study organism and

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WP039. Effects of Diclofenac to the mussel Perna perna (Linnaeus, 1758): a preliminary environmental risk assessment in Santos bay (Brazil)

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The continued increase of the human population demands a huge use of chemicals for a wide range of purposes, including human and veterinary pharmaceuticals. These substances may be considered as emerging contaminants, which are bioactive even at low concentrations (μg·L⁻¹ to ng·L⁻¹). Diclofenac is an important anti-inflammatory used worldwide and may affect non-target organisms such as crustaceans, fish and filter mussels. Diclofenac residues have been detected in surface waters, sewage treatment plants, rivers and estuaries, but studies about environmental risk and biologic effects of this drug in marine ecosystems are scarce, especially in tropical zones. Thereby, this study employed an tiered approach to evaluate Diclofenac effects on the reproduction of the brown mussel Perna perna, as well as damages on the lysosomal membrane stability. In the TIER 0, water samples (surface and bottom) were collected at 5 sites located around the diffusers of the Santos bay sewage submarine outfall for Diclofenac quantification.
The TIER I consisted of the use of acute toxicity assays (fertilization test with P. perna gametes) considering 1 hour exposure to different Diclofenac concentrations. In the TIER II, chronic effects were evaluated through embryonic development assay and Neutral Red Retention Time (NRRT) assay. The Risk Quotient (RQ) was calculated as the ratio between MEC (Measurable Environmental Concentration) and PNEC (Predicted No Effect Concentration), using a risk ranking criteria (high, medium or low risk). Diclofenac was quantified at 20 ng·L⁻¹ in site 4. An EC₅₀ of 243.5 mg·L⁻¹ was found through fertilization assay whereas effects on the embryonic development was found in embryos exposed to 10 ng·L⁻¹. The RQ calculated from these assays was 0.0002, which would, in a preliminary assessment, indicate a low environmental risk. However, the NRRT assay showed significant effects on lysosomal membrane stability in mussels exposed 96 h to 20 ng·L⁻¹ of Diclofenac. These findings pointed out risk in environmentally relevant concentrations and suggest the need of employing more sensitive responses to detect adverse effects of emerging compounds in marine environments. In this context, our results may contribute to development of new criteria of environmental risk assessments as well as pharmacological regulation.

WP040. Effects of triclosan and its interaction with UV radiation on biomarker responses of a native species (Corynodoras palaeus): ex vivo exposure of gills

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The addition of antimicrobial agents such as triclosan (TC) in personal care products intensified its presence in urban waste waters and therefore into the aquatic environment. Moreover, in presence of UV radiation (eg. sunlight), TC has been shown to degrade into two dioxins: 2,7- and 2,8-dibenzodichloro-p-dioxin and 2,3,7,8-tetrachlorodibenzo-p-dioxin, which are more toxic than the parent compound. The effect of TC and its interaction with UV radiation were assessed on biomarker responses of a native species (C. palaeus) after ex vivo exposure of gills. The biomarkers studied were the enzymatic activities of glutathione-S-transferase (GST) and catalase (CAT), total antioxidant capacity against peroxyl radicals (ACAP) and lipid peroxidation levels (thiobarbituric acid reactive substances, TBARS). Stock solution of TC was dissolved in methanol, two nominal concentrations 340μg/L (TC1) and 1mg/L (TC2) were tested. A total of 20 fish were sacrificed, and the gills were dissected and assigned to four treatment groups: saline for fresh-water fish as control (Co); methanol in saline (0.05%) (Co;sv); TC1 and TC2. All treatments were prepared in two sets: a dark set (without UV light incidence), and an UV set (solutions under ultraviolet radiation). Then the gills were kept under continuous stirring for 1h at 25°C. Statistical differences between treatments and UV or dark condition were detected using a two way analysis of variance (p<0,05) followed by Tukey’s test. No significant differences between the parameters of Co and Co;sv groups, nor effect of UV radiation in these groups were detected. TC exposure showed a significant increment (53%) in enzymatic activity of CAT respect to Co group, being higher after exposure to UV radiation. A similar response was observed in GST, mainly after UV exposure (75% TC1 and 94% TC2). On the other hand, in TC2 exposure, a decrease in total antioxidant capacity and an increase in TBARS levels (2.5 TC2 and 5.5 TC2+UV times more than in Co) were detected. In addition, TBARS levels were doubled in both TC concentrations with UV radiation respect dark condition. These results suggested that ex vivo exposure of C. palaeus gills to TC promoted changes at biotransformation and oxidative stress levels in both concentrations, which were not enough to prevent oxidative damage to lipid levels. At the same time, most of these changes were intensified after the effect of UV radiation on TC solutions.

WP041. Emerging pollutants in reservoirs: Detection and photo-degradation under simulated sunlight radiation

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The presence of emerging contaminants, such as pharmaceutical and personal care products (PPCPs), in water sources used for drinking water production have been reported. There is also a lack of detailed information on the toxicological risks that their presence may represent to aquatic environments and living organisms. PPCPs reach water bodies mainly from urban wastewater, but also from industrial and agricultural discharges. In this way, samples from two water reservoirs in Colombia were analyzed with the objective of determining the presence of a group of PPCPs, including Buprofen (IBU), Diclofenac (DIC), Methylparaben (MPB) and Carbamazepine (CBZ). Ultra-high performance liquid chromatography (UHPLC) coupled to tandem mass spectrometry (MS/MS) was employed to PPCPs detection. According to the most recent literature, LC-MS/MS is the preferred technique to measure emerging contaminants due to its robustness and the fact that it’s excellent sensitivity and selectivity. Results indicated that the occurrence of MPB (5–425ng/L) and IBU (5–62ng/L) was highly relevant in both reservoirs. On the other hand, there were not evidences on the presence of DIC and CBZ. This shows that Colombia is indeed affected by the presence of emerging contaminants and revealed the importance of monitoring these compounds, as well as other contaminants in different water bodies. In addition, pollutants photodegradation was evaluated at natural reservoirs conditions (pH, Fe and organic matter concentration) using a sunlight simulator. Results indicated that pollutants photodegradation was highly dependent on the conditions of the aquatic environment. In addition, data showed that first-order reaction kinetics describe substrates degradation adequately. In general, experimental results allow to appreciate that under evaluated conditions and after 12 h of treatment, extents of removal were between 7.9 and 11.5 % for CBZ, between 6.4 and 14.1 % for IBU, between 3.4 and 6.4 % for MPB and around 100 % for DIC. Half-life times for CBZ, IBU and MPB elimination were in the range 2-12 days; in the case of DIC photodegradation, this value was approximately 1h due to its fast removal. This implies that pollutants remain in their original form in the reservoirs for several days; but due to reservoirs high retention time (17-77 days), it is likely that evaluated PPCPs coexist with their corresponding degradation by-products.

WP042. Environmental performance of wastewater facilities addressing emerging contaminants

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One of the greatest concerns in the environmental field is associated risk due to emissions of new pollutants produced by human activities. Early identification and investigation of potential contamination is essential to protect environment. Emerging contaminant has taken relevance in the last years including a specific group of compounds, the Pharmaceutical and Personal Care Products (PPCPs). One source of important PPCPs pollution are wastewater treatment plants (WWTPs) where they can suffer degradation and sorption processes by the biomass present in biological treatments. However, the difficulty of identifying and quantifying makes the process simulation a relevant tool for behavior analysis of these compounds. There is also a another problem that arises when two or more alternative treatments are analyzed to determine which one offers the best results, not only in performance terms but also environmental efficiency. In this way the introduction of an environmental metric is useful to select the best alternative. In the present work were carried out WWTPs simulations with the GPS-X software of three treatment alternatives, including sludge treatment and PPCPs behavior in the simulations. Then, using the software OpenLCA, a life cycle impact analysis of the operation phase in each alternative was carried out to determine the most suitable option.

WP043. Esterase alterations in Oreochromis niloticus exposed to alprazolam isolatedly and in combination with the insecticide diazinon

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During the last decades some active synthesized substances used in human or veterinary medicine have been discharged into the environment without considering the possible negative consequences that would bring this action. Most of these organic compounds, defined as emerging contaminants, have been little studied and they have not yet an established environmental quality criterion. In this context, rosuvastatin (ROS) is a promising synthetic hydrophilic statin which has a number of pleiotropic properties, such as anti-inflammatory, antioxidation and cardiac remodeling attenuation. Like other statins, ROS acts as a competitive inhibitor of HMG-CoA reductase, reducing the endogenous production of cholesterol. According to IMS Health, rosuvastatin is the third best-selling drug in the United States in 2012. ROS has been found more recently in effluent samples from Europe with a detection frequency of 36%. In this study the identification of major transformation products (TPs) of ROS generated during heterogeneous photocatalysis process with ZnO was evaluated. The degradation of the parent molecule as well as the identification of the major TPs have been monitored and characterized by liquid chromatography-quadrupole time-of-flight mass spectrometry (LC-QTOF-MS/MS). Ten TPs were tentatively identified and some of them were originated from the hydroxylation suffered by the aromatic ring at the initial stages of the process. A novelty of this work was the utilization of computational analysis as a tool to help in the structural elucidation of some of the most abundant or persistent TPs. The association of computational chemistry provided a quantitative understanding of the structure and energy of molecules, and this information helped to elucidate the possible TPs identified by MS analysis. The analysis of the parameters obtained from ab initio calculations for different isomers showed the most stable structures and, consequently, the most likely to be found.

**WP046. Immunohematology effects of diclofenac in Rhamdia quelen**

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Pharmaceuticals for human and veterinary use, such as anti-inflammatory drugs, have been frequently found in aquatic ecosystems. In this study the effects of three different concentrations [0.2, 2 and 20 µg/L] of diclofenac [DIC] were evaluated. A number of 12 male and 12 female of the fish species Rhamdia quelen were exposed during 14 days. A control group were carried out for each gender. One third of the water volume was replaced twice daily in order to maintain the diclofenac concentration in each tank. After the exposure time half of the fish received carragenin [Cg] 1mg·kg⁻¹ and they were euthanized 4 h later. Hematological biomarkers [erythrocytes (ER), total and differential leukocytes counts, hematoctrit and hemoglobin concentration] and immunological biomarkers [cell migration induce by Cg and nitric oxide (NO) production in peritoneal exudate] were determinate. The results showed no increase significant in the total leukocytes and thrombocytes counts with reduction in the number of circulating neutrophils and lymphocytes in all exposed groups. The number of resident peritoneal cells decreased only at the higher concentration. Therefore a significant reduction in the Cg-induced cell migration Cg at all DIC concentrations due to a significant decrease in the migration of polymorphonuclear cells was observed. NO synthesis from peritoneal exudate in DIC-exposed fish was significant lower in 2.0 and 20.0 µg/L groups exposed with and without Cg- induced. In female occurred a decrease in ER, total leukocytes and thrombocytes counts with reduction in the number of circulating neutrophils, monocytes and lymphocytes in all exposed groups. The number of resident peritoneal cells did not differ among the groups, but there was a significant reduction in the Cg-induced cell migration Cg at the DIC concentrations due to a significant decrease in the migration of polymorphonuclear cells. NO synthesis from peritoneal exudate in DIC-exposed fish was significant lower in all groups exposed with and without Cg- induced. The alteration in these biomarkers demonstrated the inhibition capacity of DIC in the cell migration cell and NO production, making the fish more susceptible to developing infectious diseases.
Extensive use of antibiotics in agriculture is becoming an emerging environmental and public health concern at the global scale. Whereas physico-chemical and biological activities of pharmaceuticals present challenges to historical environmental assessment and management, an understanding of pharmaceutical bioaccumulation in aquatic life remains limited, particularly for veterinary medicines. Performing in vivo fish biocarcinization studies on all antibiotics is impractical in a timely fashion due to high costs, animal welfare and other considerations. Herein, in vitro models, including fish S9 substrate-depletion assays, promise to support screening level bioaccumulation assessments of environmental contaminants, and then trigger more intensive whole organism experiments. The primary objective of the present study was to determine in vitro biotransformation of select antibiotics used in aquaculture, and the common pharmaceuticals propranolol and diclofenac, using a substrate depletion approach. Following previously reported methods from our research team S9 fractions from rainbow trout (Oncorhynchus mykiss) liver were characterized and then used to carry out these experiments. Five major antibiotics used in aquaculture were selected: oxytetracycline, enrofloxacín, fleroxacin, sulphadimethoxine and trimethoprim. Propranolol and diclofenac, for which we recently reported biotransformation using this approach, were selected as positive controls. Depletion of each parent compound was monitored by liquid chromatography–high resolution mass spectrometry (LC–HRMS) using a Thermo Fisher Orbitrap. High resolution data-dependent MS/MS spectra were employed for the identification of metabolites with high sensitivity and accurate mass. Our findings indicate that hepatic biotransformation rates of these antibiotics were not significant in vitro. However, substrate depletion of propranolol and diclofenac were again observed, and their primary metabolites were identified. We then compared these metabolites to similar profiles in humans. Our results suggest that this approach is particularly promising for screening and identification of pharmaceutical metabolites in fish.

WP049. Occurrence of pharmaceuticals and personal care products in sediments from Santos Bay, Brazil
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Although the continuous input of domestic sewage in coastal areas, not only from sewage outfalls but also from illegal housing without sanitary system, few data are available about the presence of pharmaceuticals and personal care products (PPCPs) in coastal environments of South America. Given that such substances have been regarded as pollutants of emergent concern, the aim of the study was to quantify the levels of common used pharmaceutical (acetaminofén, fluoxetín, carbamazepin, diclofenac, 17α-ethinylestradiol, ibuprofén) and a personal care product (troclosan) in the Santos Bay (São Paulo), a degraded coastal area due to urban and industrial pollution. A sediment sample, composed by sediments collected in five points around the Submarine Sewage Outfall of Santos (SSOS), was analysed through LC–MS/MS. The presence of fluoroxetín (10.40 ng g⁻¹), carbamazepin (5.42 ng g⁻¹), ibuprofén (49.0 ng g⁻¹), and triclosan (15.14 ng g⁻¹) was evidenced. The levels of the other compounds analysed were below the detection and quantification limits. Considering the lack of information on the occurrence of PPCPs in marine sediments of tropical and subtropical areas of South America, these data subsidise the assessment of environmental risks of such substances in coastal zones.

WP050. Pharmaceuticals and Personal Care Products in an Urban River Sediments
G.S. Toor, University of Florida / Soil Water Science Department; Y. Yang, University of Florida IFAS

The sources of pharmaceuticals and personal care products (PPCPs) in the rural and urbanizing watersheds are largely not known. Two potential sources of PPCPs in water bodies include (1) discharge of household wastewater via septic systems and (2) discharge of domestic wastewater from wastewater treatment plants (WWTP) in streams and rivers. The objective of this study was to investigate the occurrence of PPCPs in the sediments of an urban river in Florida, USA. We collected sediments from an urban watershed to understand the persistence of PPCPs in the environment. A total of 8 PPCPs were detected across 9-sampling sites, with concentrations ranging from 0.5 to 61.9 ng/g. Among the detected PPCPs, carbamazepin (100%), caffeine (100%), trimethoprim (89%), and pseudoephedrine (63%) were frequently detected in the stream sediments. This suggested that some of the sediment sites are likely influenced by the wastewater resulting from the septic systems because there are no other known sources (such as WWTPs) of PPCPs in this watershed. This presentation will discuss our ongoing research to better understand the influence of PPCPs from septic systems on the environment.

WP051. PPCP’s determination in Maipo and Mapocho Rivers, Chile
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Pharmaceutical and personal care products (PPCPs) are considered emerging contaminants and its believed that the introduction to superficial waters is due to anthropogenic contamination. Concentration of β-estradiol, caffeine, ibuprofen, carbamazepine along with some sunscreen have been measured in both Maipo River closed to the Andes Mountains and with low human population and in Mapocho River in Santiago City, know by wastewater discharges. Samples were collected in Spring 2014 and Fall 2015, from several points in both rivers, filtered and stored until analysis. The selected PPCPs were determined by TFME coupled with GC–MS with derivatization. Analytical issues of the extraction methods and its limitations were examined in order to obtained high recoveries. Preliminary results indicate that PPCPs were not detected in Maipo River, and detected on Mapocho River. Final results will be discuss and related with possible contamination sources. Authors acknowledge FONDECYT Project 1121237 for funding.

WP052. Reactores biológicos de contacto para estudios de remoción de contaminantes emergentes en aguas residuales domésticas

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The occurrence of endocrine disruptors in urban effluent and its removal by biological treatment in series

Emerging contaminants such as endocrine disruptors, active drugs and personal products are always of interest in environmental studies because they are related, among other factors, to the appearance of anomalies in the endocrine system of several aquatic species. Among the contaminants that affect the aquatic environment, the most significant are those from industrial effluents, domestic sewage and from veterinary use. In this context, we performed a work involving studies of processes for the treatment of a domestic sewage in an urban area of south Brazil. The samples were collected in the wastewater treatment pilot plant, in two different sites: one in the process input (tributary) and one at the output after the treatment (effluent). This station is located in the city of Canoas / RS which belong to the urban area of Porto Alegre (the capital of Rio Grande do Sul State). This treatment pilot plant was constructed by the Institute of Hydraulic Research (IPH) of UFRGS, and the process employs three biological treatment steps in sewage series (tributary), passing initially by an up flow anaerobic sludge blanket (UASB), then by an aerobic reactor in Biological Contactor Rotating mode and finally by a system containing vertical flow constructed wetlands (two units in series), followed by two horizontal flow constructed wetlands, which constitutes the final stage of the treatment. Sample collection was carried out between the months of December 2013 to December 2014, and in total 10 samples were collected. The studies focused on the occurrence of 112 drugs (antibiotics, hormones, b-blockers, etc). In the first five sample collection there was only domestic sewage from the city of Canoas, while in the last five samples the effluent also contained leached (at a maximum of 10% of the total flow). This leached came from a landfill with more than 10 years. The introduction of leachate aimed to verify the influence of this effluent in the compounds under study and assess the feasibility of adding into the treatment system, as this is a questionable procedure that can render a lot of discussion. Antibiotics were the most frequently detected during the months of collection, but with high removal rates. After leached input the occurrence of drugs reduced considerably, showing a better removal rate.
WP053. Responses of hepatic biomarkers of *Cyprinus carpio* after exposure to sublethal concentrations of an emerging pollutant (triclosan) in water

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Triclosan (TC) is a halogenated phenol, antimicrobial and antifungal agent, contained in numerous personal care products used in daily life (gels, toothpastes, deodorants, cosmetics, etc.). In this work, the responses of hepatic biomarkers were evaluated in juvenile of *Cyprinus carpio* after prolonged exposure to two sublethal concentrations of TC. Fish (body weight = 10.8 ± 0.4 g, n = 40) were kept in controlled conditions in aquariums with daily renewal of the media and concentrations of methanol used (Co.sv). Water samples for physicochemical determinations and toxic levels were taken. After 21 d of exposure, fish were measured, weighed, fixed and processed for histology. Slides were stained with Masson’s trichrome. Histological analysis was performed in liver sections to discriminate between control and exposed fish. In controls, normal liver histology was observed. In TC-exposed fish, histological changes were observed such as hepatic vacuolization and fibrous degeneration. These findings suggest that triclosan affects liver function and could be considered as a potential environmental contaminant.

WP054. Selection of biomarkers to evidence atenolol effects on fish

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Atenolol is a β-blocker (β1 receptor antagonist) pharmaceutical used to treat hypertension and cardiovascular diseases. It has been frequently detected in several urban rivers given its high consumption, low hepatic metabolism (mainly excreted as parental drug), low percentage of removal in wastewater treatment plants (WWTP), stability upon microbial degradation and low sediment absorption. In the Suquía River basin (Córdoba, Argentina) atenolol has been detected in river water (up to 0.5 µg/L) and fish samples (up to 14 ng/g wet wt.). Given the few ecotoxicological data reported, different effect endpoints were measured under laboratory conditions on an already proposed bionindicator fish species inhabiting Suquía river, *Jenynsis multidentata* (Anaballidae, Cyprinodontiformes). The main goal of this study was to identify the most efficient biomarkers to discriminate between exposed and control fish (3 groups) using HPLC-EC as a monitoring tool for atenolol concentration. The atenolol concentration (0.5±0.2 g; 29±2 mm) were exposed to 0.002% methanol (control), 1/µL atenolol (environmentally relevant concentration) and 50/µL atenolol during 14 days under semi-static conditions (media renewed every 48 h, atenolol concentration measured before and after renewal). Effect biomarkers evaluated included: biotransformation (microsomal and cytosolic glutathione S-transferase (GSTm, GSTc) and antioxidant (catalas CAT, glutathione peroxidase-GPx and glutathione reductase-GR) enzymatic activity, acetylcarnitineroreductase activity (ACHe) and swimming behavior variables (distance and average speed). Stepwise linear discriminant analysis (DA) was carried out to select most efficient biomarkers to discriminate between exposed and control fish (3 groups) using a stepwise selection of 8.0 justification. DA selected 6 variables to discriminate between groups with 100% accuracy by forward stepwise method. These variables were: brain AChE, intestine GSTm, intestine CAT, brain GR, gills GPx and gills CAT, of which the first 3 were the most important. By backward stepwise method only selected brain AChE as the minimal variable to discriminate between groups with 78% accuracy. Therefore brain AChE was the most effective biomarker to discriminate between atenolol exposed and control fish and it is proposed as a useful atenolol effect biomarker in fish under laboratory conditions.

WP055. The antidepressant fluoroxetine affects food intake in cichlid fish.

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Pharmaceuticals are commonly used to improve human and animal healthcare. These compounds are known as ‘emerging concern pollutants’ since after their consumption and excretion, they reach freshwater bodies as wastewater treatment plants are incapable of removing them, and could therefore affect non-target organisms. Among antidepressants, SSRIs -Serotonin Selective Reuptake Inhibitors- are prescribed for several psychiatric disorders, such as obsessive-compulsive disorder and feeding alterations. In vertebrates, serotonin (5-HT) regulates behavior, humor, sexual impulse and appetite. Particularly, fluoxetine (FLX) is the active ingredient of one of the most consumed SSRIs worldwide, Prozac®. The main objective of this work was to evaluate the effect of FLX on the food intake rate in Cichlasmis dimerus, a South American freshwater fish who displays distinctive social hierarchies and aggression patterns. Additionally, we analyzed the relationship between feeding, liver and brain serotoninergic and dopaminergic systems: on one hand, fish received dietary solutions containing 0.05% or 1.0% FLX for 5 d, injection for 5 days of saline 0.6% (control group), 2 or 20 µg/g of FLX. Daily food intake was quantified throughout the experiment. At the end of the experiment, levels of 5-HT and its metabolite 5-HIAA were determined in brain using HPLC-EC as a measure of brain serotoninergic activity. Livers were weighed, fixed and processed for histology. Slides were stained with Masson’s Trichromic and PAS techniques. Although no significant alterations were increased 34% in fish exposed to TC2 respect to Co group. These results suggest that exposure to TC promoted an inhibitory response at both biotransformation and antioxidant activity given mainly by SOD. Exposure to TC2 showed that oxidative damage to lipid in the liver was promoted.
registered on brain serotonergic activity for neither i.p. nor i.m. experiments, a tendency towards a dose-dependent increase was observed for i.m. In groups injected with 20 μg/kg of FLX a marked decrease on food intake was observed in both cases. This was associated with the presence of intense acidophilia, lack of lipid reserves and marked area reduction of hepatocytes. No alterations were observed in hepatosomatic index or body weight. These results may indicate that FLX has the potential of producing an anorexigenic effect in C. dimerus adults, hence it could impact over reproductive physiology and behavior of this species, considering that aggressive interactions and the establishment of social hierarchies are pivotal for reproductive success.

WP056. Toxicological evaluation of sediment spiked with pharmaceuticals: energy status and neuroendocrine effects in marine polychaetes Hediste diversicolor.

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There is a lack of studies about the ecotoxicology of pharmaceutical products on marine environment. To predict possible adverse effects of pharmaceutical products on benthic biota, polychaetes Hediste diversicolor were exposed for 14-days to pharmaceutical-spiked sediments under laboratory conditions. Carbamazine (CBZ), ibuprofen (IBP) and propranolol (PRO) at concentrations of 500 ng·g⁻¹, 50 ng·g⁻¹, 5 ng·g⁻¹, 0.5 ng·g⁻¹ and 0.05 ng·g⁻¹, fluoroxetine (FX) and 17α-ethynylestradiol (EE2) at concentrations of 100 ng·g⁻¹, 10 ng·g⁻¹, 1 ng·g⁻¹, 0.1 ng·g⁻¹ and 0.01 ng·g⁻¹, including environmental concentrations (underlined), were spiked in marine sediment samples. After the exposure, cellular energy status (total lipids content – TLP; and mitochondrial electron transport activity - MET), metabolism of monoamines (monoamine oxidase activity - MAO) and inflammation properties (cyclooxygenase activity - COX) were observed in polychaetes. CBZ increased TLP content and MET activity, and decreased MAO activity in polychaetes. IBP did not interfere on the TLP level, but on the MET and MAO activities (environmental concentrations). FX did not cause changes in the energy status. Therefore, environmental concentration diminished MAO activity. EE2 did not affect the energy status, however, MAO activity was significantly lower in polychaetes exposed to environmental concentration. PRO increased TLP level in polychaetes, but not MET activity. MAO activity was significantly lower for polychaetes exposed to environmental concentration. Except FX, all pharmaceuticals showed anti-inflammatory properties confirmed by the decrease of COX activity. Pharmaceutical products affected H. diversicolor physiology and health. As a benthic top predator, adverse effects on sea-worms can potentially culminate in ecosystem perturbations.

WP057. Triclosan interferes in hematological parameters and acetylcholinesterase activity of fish Prochilodus lineatus after 24 hours of exposure?

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Triclosan (TCS) is a broad spectrum antimicrobial largely used as an ingredient in a number of personal care, veterinary, industrial and household products. TCS is commonly detected in aquatic ecosystems, as it is only partially removed during the wastewater treatment process, and it can be toxic to several non-target organisms, especially of aquatic biota. Thus, the aim of this study was to evaluate the effects of triclosan on hematological parameters and acetylcholinesterase activity of the fish Prochilodus lineatus after 24 h exposure. Juvenile of P. lineatus (n = 35; 18.7 ± 4.5 g), supplied by the Fish Hatchery Station of Londrina State University (UEL), were acclimated for 5 days and then transferred to glass aquaria containing 80 L of water (CTR), water with TCS at the following concentrations 0.5 μg·L⁻¹ (TCS 0.3), 3 μg·L⁻¹(TCS 3) and 30 μg·L⁻¹ (TCS 30) or with 0.3 μL·L⁻¹ of methanol (MET), which corresponds to the concentration of the solvent used in the dissolution of triclosan. Each aquarium received seven fish that remained under these conditions for 24 h. After exposure, the animals were anesthetized for removal of blood and killed by median section for the removal of the brain and muscle. Blood was used for the determination of the number of total erythrocyte (RBC), hematocrit and hemoglobin content. Brain and muscle were homogenized in phosphate buffer, centrifuged and the supernatant was used for the determination of acetylcholinesterase (AChE) activity. For each parameter analyzed, the results were compared among the groups (CTR, MET, TCS 0.3, TCS 3 and TCS 30) using analysis of variance (ANOVA) followed by multiple comparison test (SNK) when necessary. Despite an apparent trend of hemoglobin increase and hematocrit decrease, no significant differences were detected in the hematological parameters between groups. AChE activity, both in brain and muscle, did not vary significantly between the groups. Therefore, we concluded that 24 h exposure to TCS did not affect the tested biomarkers in fish. Further tests with longer exposure times and other biomarkers should be conducted to better understand TCS effects on this fish species.

WP058. Use of β-cyclodextrin on cytotoxic activity of the dye direct black 38

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Introduction: Direct Black 38 (DB38) is a triazo dye based on benzidine, an aromatic amine, classified as a human carcinogen by the IARC. Although the European Community has banned the use of benzidine-based dyes since 2003, these compounds have been detected in wastewater of developing countries, including Brazil. Considering that effluents from textile manufacturing processes contain an average concentration of 300 mg/L and that the conventional treatments are ineffective in removing some of the toxic properties of the dyes, a molecular complexation with cyclodextrin (CD) could be an attractive method in environmental remediation. CDs have a hydrophobic cavity and hydrophilic exterior. They are able to bind compounds from a mixture with high selectivity and chemically stable. Purpose: We have investigated the effect of β-CD on cytotoxic activity of the dye DB38. Methods: DB38-β-CD complex was prepared in the 1:1; 1:2; 1:3 and 1:4 molar ratios, dissolved in PBS (pH 7.4), maintained under stirring at 500 rpm and 25°C for 24 h. Cytotoxicity was evaluated after 48 h exposure of the mouse thymoblasts Balb/c 3T3 to dye DB38 at concentrations ranging from 0.001 to 100 μg/mL, β-CD at 0.0005 to 5000 μg/mL and to DB38-β-CD complex at 0.01 to 10 μg/mL, using neutral red uptake (3T3 NRU) assay from EURL. ECVAM recommendation. Results: DB38 was cytotoxic for 3T3 cells with IC50 of 3.574 μg/mL and it classified as Category 3 (DLSO of 169.74 mg/Kg predicted from IC50 value) according to Globally Harmonized System. β-CD showed IC50 more than 5000 μg/mL (non-toxic substance and GHS not-classified) and DB38-β-CD 1:1; 1:2; 1:3 and 1:4 remained cytotoxic for 3T3 cells. Therefore, the complexation with β-CD was not efficient on suppression cytotoxic activity of the DB38 in the tested conditions.

Urban Air Pollution: Predictive Models and Estimation of Emissions

WP060. Air concentrations of Polycyclic aromatic hydrocarbons (PAHs) in Concepcion city in Central Chile using PUF disk as passive samplers

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Polycyclic aromatic hydrocarbons (PAHs) are environmental contaminants of international concern because they can cause adverse effects to humans and the environment. Urban areas are heavily populated zones and also tend to be centers of industrial activity where chemicals are emitted to the atmosphere, transported, and then deposited. Consequently, human exposure is one of the main risk associated to anthropogenic activities and urban/industrial development conditions. In this study passive air samplers, containing a polyurethane foam (PUF) disk, were deployed in Concepcion’s (CON) in=9) during ~2 years, 2008 to 2009. PAHs (16 EPA prioritized compounds) were determined by gas chromatography and mass spectrometry (GC/MS). A sampling rate (R), typical of urban sites, of 4 m3/day was used to estimate the atmospheric concentrations of individual compounds. Results show that the level of PAHs fluctuated 4 – 400
characterize the atmospheric distribution of POPs at local, regional and global scales. In this study passive air samplers, containing a polyurethane foam (PUF) disk, were deployed in three cities of Chile, Santiago (STG)(n=5, sampling sites), Concepción(CON)(n=9) and Temuco (TEM)(n=6) during -2 years, 2008 to 2009. PCBs (7 indicator congeners) were determined by gas chromatography and mass spectrometry (GC/MS). A sampling rate (R), typical of urban sites, of 4 cm2/200s was used to determine the background concentration of PCBs. Results show that the level of PCBs (pg/m3) ranged from ~1 - 10 (TEM), ~1 - 40 (STG) and 4 - 30 (CON). STG presented the lowest air concentrations and its PCB levels are likely related to evaporation from urban surfaces. These results are one of the few contributions that reports air concentrations of PCBs, concurrently, at urban sites in Chile and are useful to assess atmospheric pollution by POPs. The study also demonstrates the feasibility of PUF disk passive air samplers as a simple tool for generating air concentrations of SVOCs in support of national, and regional assessment and risk management efforts.

WP063. Assessment of pollution in the vicinity of the industrial center of puchuncavi-ventanas in central Chile

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The Puchuncavi valley (PV) (71°24'5, 32°40'N), is characterized by high pollution levels due to discharge of gaseous pollutants and particulate matter (PM) from the coal-fired power plants, a copper smelter1,2. On the other hand, an increase in the concentration of trace elements (TE) in the soil, due to deposition of PM, may cause an ecological risk. Representative sampling areas were selected to evaluate the impact of the industrial zone. Sampling sites were La Greda (LG), Los Mañones (LM), Puchuncavi (PU) and Valle Alegre (VA), located around the industrial zone at different distances. Since 2007, CETAM has characterized the chemical quality of atmospheric deposition and soil in the PV by means of pH, electrical conductivity (EC), gravimetric, ions and elements analysis. The amount of settleable particulate matter (SPM) deposited in the PV, does not show a clear trend throughout the study (2009-2014) at all monitoring stations, however, statistical analysis shows that LG presents a significant difference in the amount of SPM compared to the other monitoring stations, the same situation is observed for CE. Acid deposition events (pH<5.6), not show a trend between 2008 and 2011, however, starting in 2012, is observed an increase in the acid precipitation events, from 19.2% to 37.5% in 2014. With respect to the evolution of SO42- and NO3- present in SPM, it shows no particular trend over time. But by decomposing the total SO42- in marine and non-marine sulfate, it was observed in 2014, a significant increase in the contribution of marine SO42- at total, from 22% to 50%. The enrichment factor (EF) SO42- estimated in SPM, it shows a decline from 37.7 in 2011 to 7.13 in 2014. Due to the deposition of TE in the soil, ecological risk. It was estimated by integrated pollution index (IPI), calculated from soil samples collected between 2007 and 2011 gave a value > 5, extremely high pollution level for LG, LM and PU3. The LG is the most impacted by the pollutants with respect to other monitoring stations, mainly due to its proximity to the emission source. References: 1) Neuman A., et. al. 2009. Geoderma 150:359-366. 2) Neuman A., et. al. 2012. Ecotoxicol Environ Saf 80:386-392. 3) Salamanghabesi S., et. al. 2015. Science of the Total Environment 527-528 335–343. Acknowledgments: AES-Gener S.A. AECID AI03781311; project CTQ2014-52309-P; FEDER GR15087, Gov. of Spain.


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Individuals living in areas with high concentrations of pollutants frequently report ocular symptoms. Clinical signs and histological changes of the ocular surface in face of exposure to ambient levels of air pollution have been documented. Usually, ophthalmologists do not regard air pollution as a possible cause of the aforesaid alterations. Our group has demonstrated in previous studies that there is a correlation between ocular surfaces symptoms and signs and individual exposure to combustion-derived air pollution. The aim of this study was to evaluate the effect of Buenos Aires Particulate Matter (PM-BA) on the proliferation and secretion of pro-inflammatory cytokines (TNF-α, IL-6, IL-1β and IL-8) in human conjunctival epithelial cells (IOBA-NHC). The PM-BA
was obtained on PTFE filters by a Gent Stacked Filter Unit Sampler. IOBA-NHC were incubated with PM-BA (10-100 μg/ml) for 24h. Cell proliferation was evaluated by the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay. Pro-inflammatory cytokines were determined by ELISA kit. Also, the PM-BA was analyzed with SEM-EDS. PM-BA significantly decreased the proliferation and secretion of IL-8, but increased the secretion of IL-6 on IOBA-NHC cell line in dose-dependent manner. Release of TNFα and IL-1β was observed. PM-BA showed sizes in relation to PM2.5, the 2.0-30 nm particles were found as agglomerates around 700-800 nm. The element concentration of PM-BA was C, 82.02±6.95%; O, 14.72±5.16%; Na, 1.15±0.58; and trace elements. These findings suggest that the human conjunctival epithelial cells incubated with PM-BA showed cytotoxicity and an inflammatory response mediated for IL-6, not for TNF-α, IL-1β or IL-8.

**WP065. Determinaci

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La determinación de la calidad del agua de un sistema acuático se valora a través de la medición de numerosos parámetros fisicoquímicos, biológicos e hidromorfológicos que varían tanto estacional como esencialmente. Las cuencas de los arroyos Los Hormilllos y Arroyo del Medio (Sierras Grandes, Córdoba, Argentina), se encuentran sometidas a manejos de suelo no planificados, a una creciente demanda del recurso hídrico, intensas sequías, incendios y deforestación. El Arroyo Los Hormilllos abastece de agua para consumo a la población homónima y al menos el 30% de la cuenca del Arroyo del Medio está reforestada con una especie exótica, el pinus spp. Según la OMS, el uso frecuente de agua de río para el consumo humano aumenta el riesgo a la salud; por lo tanto establecer la calidad del agua es de total importancia ya que determina la posibilidad de su uso para diferentes propósitos, asegura la protección del recurso como factor clave para la provisión de un agua de bebida segura y permite tomar las medidas adecuadas para una buena gestión del mismo. Una de las formas más efectivas de comunicar la calidad del agua es a través de Índices de Calidad (ICA). Un ICA es una expresión numérica usada para transformar un gran número de datos variables a un número simple que describe la calidad del recurso hídrico. En este trabajo preliminar se midieron numerosos parámetros a lo largo de los dos arroyos y se calcularon dos ICA utilizando métodos diferentes. El primero, desarrollado por la Fundación de Sanidad Nacional de Estados Unidos (NFS ICA) y el segundo, perfeccionado en Canadá (CCME ICA). En ambos casos los resultados fueron similares para ambos arroyos determinando que el agua de los mismos presenta una tendencia de excelente a buena en los diferentes puntos y en las distintas épocas medidas. Se sugiere continuar con este estudio utilizando algún método estadístico como el Diseño de Superficie de Respuesta (DSSR) o bien para cualquier curso superficial que se desee estudiar.

**WP066. Differential susceptibility to particulate ambient air pollution exposure in a chronic nutritional stress model**

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Introduction: Air particulate pollution negatively affects the health of the population exposed, been the lung the main target organ. Evidence of the interference between nutritional status and oxidative stress and inflammation caused by air pollution have been documented. Previously, we demonstrated homeostatic stress systems activation in growing rats, under chronic nutritional stress. However, in the present model there is no evidence of adverse outcomes due to pollution environment exposure. Objective: The aim of this study was to assess the susceptibility to particulate ambient air pollution (Residual Oil Fly Ash-ROFA) exposure in growing animals under chronic nutritional stress. Materials and Methods: Twenty-eight weaning male wistar rats were randomized in two groups regarding food intake: 1) ad libitum food intake (Control-C), or 2) 80% of the amount of food consumed by control (Chronic Nutritionally Constrained, CN). After 8 weeks, the CN group was fed periodically either with ROFA (1mg/kg BW) or saline solution defining 4 groups: C, CNS, C+ROFA, CNS+ROFA. After 24h, broncho-alveolar lavage fluid was obtained and the following parameters were examined: Total Cell Number (TCN), DifferentialCell Count (CCD) and superoxide anion (O2-) generation. Results: TCN augmented after ROFA exposure being only significant for C+ROFA group (C: 8.9±1.5 vs C+ROFA: 17.0±3.1;p<0.05; CNS: 5.3±0.6 vs. CNS+ROFA: 9.7±1.6; ns). DCC analysis showed no differences in cell distribution between C and CNS groups. However, ROFA induced both in C and CNS an increase in the polymorphonuclear cells percentage (%PMN). C+ROFA animals depicted a higher %PMN (50%) when compared to the CNS+ROFA (40%) group. O2-.generation significantly increased in all groups when compared to C group. Again, ROFA exposure increases O2-. generation being higher in C+ROFA than CNS+ROFA (ROFA: 1.26±0.12 vs. CNS+ROFA: 0.8±0.01; p<0.001). Conclusion: Our results suggest that CNS animals are prone to an impairment in the lung response to particulate ambient air pollution showing a differential susceptibility.

**WP067. Direct and indirect air particle effect on lung alveolar macrophage and cardiac-myocyte on culture**

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Air particulate matter has been associated with adverse effects in the cardiorespiratory system leading to cytotoxic and proinflammatory effects. Particulate matter-associated cardiac effects may be direct or indirect. Direct interactions may occur if inhaled ultrafine particles and/or particle components cross the air–blood barrier while, indirect interactions may occur as the result of pulmonary inflammation and consequent release of inflammatory or oxidative mediators into the blood circulation. Therefore, we considered important to investigate the effect of Residual Oil Fly Ash (ROFA), a surrogate of ambient air pollution, a) directly on alveolar macrophages (AM) and cardiomycocytes (HL-1) in culture or b) indirectly by analyzing the biological response of HL-1 to macrophage particle-exposed conditioned media (CM). After 24h ROFA (1, 10 and 100 μg/mL) or CM exposure, cultured cells we assessed for: viability by MTT, superoxide anion generation (O2-) by NBT or DHR 123 and IL-6 by ELISA. Our results showed that a) ROFA direct effect on AM induced both generation of O2- at 1 and 10 μg/mL doses (C: 25.8±6.07 vs R1: 43.7±8.54, R10: 42.5±6.45 %, p<0.05) and production of IL-6 at 1 μg/mL (C: 20.67±6.42 vs R1: 49.0±41.11pg/ml, p<0.05). A reduction on these two parameters was seen for 100 μg/mL. The latter observation was concomitant with the reduced viability (C: 0.51±0.036 vs R10: 0.20±0.005 ABS; p<0.05) found at this dose. On the contrary, ROFA was not able to induce any effect on HL-1 on the dose range tested. When b) ROFA indirect effect was assayed on HL-1 cells, we observed that CM provoke a reduction in cell viability (C: 1.13±0.09 vs R1CM: 0.49±0.06, R10CM: 0.10±0.06, R100CM: 0.04±0.01ABS, p<0.05) and an increase on O2- generation and IL-6 production (C: 8.52±2.89 vs R1CM: 48.8±217.66, R10CM: 15.04±30.84pg/ml, p<0.05). Our in vitro findings employing lung and cardiac myocyte cells provide support to the hypothesis that particle-induced cardiac alteration may possibly involve lung derived mediators.

**WP068. Effects of volcanic ash from Puychue eruption on proliferation and pro-inflammatory cytokine release of human conjunctiva**

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Volcanic eruptions produce a significant particle burden in the atmosphere leading to adverse effects on human health. The respiratory system, skin and ocular surface are the most vulnerable to particulate matter exposure. The aim of this work was to evaluate the effect of volcanic ash from 2011 Puychue eruption on proliferation and secretion of pro-inflammatory cytokines (TNFα, IL-6, IL-1β and IL-8) in human conjunctiva epithelial cells (IOBA-NHC). Volcanic ash was collected from the urban area of Villa La Angostura three months post volcanic eruption. To remove the coarse dust component, ash samples were passed through a 0.5mm mesh metal sieve. SEM and EDS were employed to characterize particle size and chemical composition. IOBA-NHC were exposed to different ash concentrations (50, 100, 500, 1000 μg/ml) for 24h. Culture medium was used as control. Pro-inflammatory cytokines were detected in supernatants using ELISA kits and cell proliferation was determined by the MIT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay. Cell viability was not affected after exposure with up to 100 μg/ml ash particles. IOBA cells exposed to high concentrations of volcanic ash (500-1000 μg/ml) increased the release of IL-6 and IL-8 compared to control (p<0.05). No release of TNF-α or IL-1β was detected. Particle size from ash samples was heterogeneous ranging from less than 10μm up to 300μm. The surface elemental composition of ash particles include C (40.2±6.1%); O (45.5±3.8%); Si (9.3±1.5%); Al (2.1±0.3%) and trace elements. These results suggest that volcanic ash from 2011 Puychue eruption

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produce a cytotoxic effect on human conjunctiva cells. In addition, IOBA-NHC exposed to high concentrations of ash particles develop an inflammatory response mediated by IL-6 and IL-8.

**WP069. Green methodology to determine POPs in airborne particles**

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POP s are organic synthetic compounds, highly toxic and persistent in the environment. They are not easily degraded and can be accumulated in the tissues of the organisms. Due to its persistence, POP s are dispersed around the planet mainly by direct emission, lixiviation, air transportation and deposition. Soxhlet extraction (SE) had been used as a conventional method to extract POPs in the airborne particle matter. This study introduces the application of an Ultrasound Assisted Extraction Cell (UACE) which minimize the sample manipulation, solvent amount, energy and time consumption in the simultaneous analysis of organochlorides (OCs) and polybrominated diphenyl ethers (PBDEs) by gas chromatography-mass spectrometry-negative chemical ionization (GC-MS-NCI). The aim of this paper is to show the results about the optimization and validation of a methodology for the analysis of 16 OCs and 7 PBDEs in atmospheric particle matter collected in Teflon covered glass fiber filters using Ultrasound Assisted Extraction (UASE) and GC-MS-NCI analysis. Single factor experiments were done to select the solvent and number of consecutive extractions. Three key variables (temperature, time and ultrasound potency) were studied in a factorial experiment design (3 variables, 2 factors). The best conditions were 2 extractions with 5 mL (each) of dichloromethane by 5 minutes (each) at 80 °C of ultrasound potency (frequency 40 kHz). Recovery of 16 OCs and 7 PBDEs ranged between 80.4 ± 3.6 % and 110.6 ± 5.6 %. Variations coefficients were between 1.1 and 5.6 %. Pearson coefficients (r) were higher than 0.90. LODs were from 0.6 to 2.7 pg m⁻³ and LOQs from 1.4 to 9.0 pg m⁻³. The method was applied to 75 samples taken in three seasons (dry warm, rain and dry cold) in 5 sites of Metropolitan Area in Mexico City (northeast, northwest, center, southeast and southwest) -lindane showed the highest concentrations (27.1 – 89.8 pg m⁻³) suggesting the use of pesticide even though it is forbidden. BDE-99 was found in all sites and seasons in similar concentrations (1.5 – 15.0 pg m⁻³). DDE, endrin aldehyde and BDEs -47, -100, -153 and -154 which were found in similar order concentration. The methodology used in this study can be a green analytical methodology to determine POPs in the airborne particle matter, reducing the waste generation of organic solvents. EBM acknowledges to CONACyT for PhD scholarship Research. This study is financial supported by projects: PAIIPT No. IN116614 and CONACYT 191335 bilateral Mexico-Argentina.

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**WP070. HPA emissions from combustion of diesel, biodiesel and butanol blends**


Fossil fuels are compounds made by carbon chains as a result of organic matter decomposition. Burning these fuels is possible to produce intensive atmospheric pollution with highly toxic gases. Considering this situation, the development and production of green fuels that offer less impact to the environment is necessary. The aim of this work was to study the behavior of the HPA formation from the combustion of blends containing S-500 diesel + 5% of n-butanol and S-500 diesel + 5% of biodiesel. Many of HPA are toxic, mutagenic and carcinogenic and harmful to the environment in general. For the tests was used an absorption column with fixed bed of porcelain attached to an exhaust system from a diesel stationary engine. The blends were burned during 30 minutes and after that, deionized water was supplied to the top of absorption column in counter-current way to the smoke from the exhaust system of the engine. The water was collected at the bottom of the column. The HPA was monitored by ELISA test probe from Trios. The result for HPA to the n-butanol blend was 38.27 µg L⁻¹, while the result to the biodiesel blend was 21.01 µg L⁻¹. We suggest that the biodiesel is a good choice to improve the burning of diesel and reduce de HPA formation that could minimize the risks of the smoke from the combustion process of diesel. It is suggested to evaluate the toxicity of the produced water to check if the HPA could be a good marker to estimate the risks of toxicity.

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generation of O₂⁻ was observed. On the ocular surface both the tarsal and the bulbar conjunctiva showed in the AAP-BA mice a significant increase (p < 0.05) in goblet cell density. However, after 12 months post-exposure a reduction on this parameter was observed. Hence, our results suggest that, in this animal model, the chronic exposure to AAP-BA generated variations on the morphophysiology and inflammatory response of the mice lung and ocular surface probably reflecting the pulmonary and ocular state of the inhabitants from Buenos Aires city.

WP073. Protective effect of simvastatin on human neuronal line SHSY5Y to particulate matter exposure
S. Farrant, Biology; J.S. Yaksich, Hampton University / Department of Pharmaceutical Science; D. Tasat, National University of San Martin UNSAM / Biology

Epidemiological studies have shown positive association between ambient particulate matter (PM) exposure and adverse health effects. PM effects can be either direct or indirect, mediated by soluble factors able to cross the blood-brain barrier gaining access to the CNS. Its effects are associated with low IQ, autism and neurodegenerative pathologies. ROFA (Residual Oil Fly Ash), a known ambient PM surrogate, induces reactive oxygen species such as superoxide anion (O₂⁻). On the other hand, Simvastatin (Sv), commonly used to lower blood cholesterol levels by blocking Mevalonate (Mv) synthesis, has shown antioxidant properties. Therefore, our objective was to evaluate in vitro if Sv has an antioxidant protective effect on ROFA exposed-SHSY-5Y (human neuronal cell line) cultures. Cultured cells were divided in 4 groups: 1) controls (C: no treatment); 2) only Simvastatin (1 µM); Sv (1 µM) + Mv (1 µM); Mv (Simvatinat and Mevalonate), 2) exposed to ROFA (5, 10 or 50 µg/ml) for 24h, 3) pre-treated with Sv for 6 days and exposed to ROFA, 4) pre-treated with S½-MV(1 µM) for 6 days and exposed to ROFA. We evaluated: cell viability (MTT), O₂⁻ generation (NBT), cell senescence (β-gal activity), antioxidant transcriptional factor Nrf2 (anti-Nrf2) and apoptosis (Caspar 3 and PARP). Cell viability significantly diminished for ROFA 10 and 50 µg/ml, whereas O₂⁻ generation, cell senescence, Nrf2 nuclear translocation and apoptosis increased in a dose dependent manner (p< 0.001). Sv pre-treatment alleviated ROFA adverse effects maintaining cell viability close to basal levels and reducing O₂⁻ generation, cell senescence and apoptosis. The rise in Nrf2 nuclear translocation in all pre-treated Sv cultures suggested that in part Sv protective effect could be mediated by the induction of antioxidant response elements to balance O₂⁻ generation. These results were not modified by Mv, showing that Sv effect is independent of the cholesterol synthesis mediators. We conclude that pretreatment with Sv independent of its ability to inhibit HMGO-CoA, protected human neuronal cell line SHSY-5Y against the adverse effects caused by ROFA exposure.

WP074. Relevance of airborne fungi and their secondary metabolites for environmental, occupational and indoor hygiene after Jeddah flood, Saudi Arabia
F. Bokhari, King Abdul Aziz University / Microbiology

A relationship was found between the presence of household mould and the increase in the incidence of health problems. Therefore, total fungal count and the commonest genera were detected for 60 house from four regions of Jeddah during summer, 2011, at temperature between 30 -45°C and Relative Humidity (15-40%). Total of 1800 indoor air and wall swap samples were collected from each house, 3 samples from each room. The total fungal counts were 1053, 1099, 857 and 797 cfu/m³ for North, South, East and West regions, respectively. The highest counts were found in bathroom. 30 species belonging to 18 genera were isolated and identified on PDA. The most common genera were Aspergillus, Penicillium and Cladosporium. The harmful black mold fungi, A. niger, Alternaria alternate, A. chlamydomospora, Chomatium funicola, C. herbarum, C. macrocarpum, Exophiala jeaneseni, Humicola lanuginose, H. grasia, Syncephalastrum racemosum, Stachybotrys chartarum, S. chlorohalonata and Ulocladium chartarium were the most abundant species. A. niger followed by Syncephalastrum racemosum and C. herbarum were the most frequent species. The dangerous fungi Stachybotrys chartarum and S. chlorohalonata were found only in south and north regions. In conclusion, higher levels of fungal contamination were differed significantly with the region and dark fungi were generally associated with some places especially the kitchen.

WP075. Standardization of Caiman latrostris lymphocyte culture for the application of Chromosomal aberration test
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The aim of this study was to standardized the Chromosomal Aberration (CA) test on C. latrostris lymphocytes, as there were no previous reports of its application in any crocodilian species. In order to obtain suitable metaphases for CA analysis, different methodological adjustments were done to the conventional technique for karyotype analysis on C. latrostris. First, serial cultures were performed at different times in order to establish the duration of lymphocyte cycle, data not known for this species. Then, different variations were tested in various parameters of culture and harvest processes, as well as fix and dird conditions, including: culture time and temperature, culture of whole blood or isolated lymphocytes, type of culture mediums, amount and action time of mitogen (Phytohemagglutinin -PHA), type and action time of hypotonic solution, type of fixed solution and dird conditions (temperature and slides pre-treatment). Once optimal culture conditions were adquire, we conducted an assay for the standardization of the CA technique. We exposed whole blood in vitro to the known CA inductor agent Methyl methanesulfonate (MMS) at 10 and 20 µM, and a negative control (NC) without exposure, all groups with and without colchicine, to evaluate CA induction at metaphase, post-metaphase and existing basal cell damage in this population. Our results constitute the first report on the application of the CA test in C. latrostris, as well as in all crocodilian species, and allow us to propose this technique as a new biomarker of genotoxicity to be incorporated into the battery of tests (Micronucleus test, Nuclear Abnormalities test, Comet Assay, Repair assay) routinely applied by our group in the assessment of the genotoxic effect produced by different agents in this and other native reptile species.

WP076. Contribution to the analysis of environmental conditions, occupational health and public work in the metropolitan area of Guadalajara
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Globally, workers in general have basic benefits of the laws on health and safety at work; however LaDow (2005) notes that the International Labour Organization (ILO), the law of health and job security covers only about 10% of the population in developing countries and such laws avoid various industries and hazardous occupations, including agriculture, fishing, forestry and construction. The construction industry includes current and specialized construction activities for buildings and civil engineering works as well as repairs, additions and alterations, the building site and install prefabricated structures and the construction of temporary buildings. OBJECTIVE: To analyze the environmental, labor and health conditions of public works in Guadalajara Metropolitan Area (GMA). MATERIALS AND METHODS: The study consists of measuring noise and PM10 in a number of selected public works and application of surveys to workers and neighbors of the works studied. RESULTS: In the samplings, sound pressure levels outside those recommended by the World Health Organization (WHO) limits, and high levels of PM10 particles that pose a potential health risk were found. A series of surveys were applied to meet general characteristics of workers as well as complaints and symptoms related to their health. CONCLUSION: It is necessary to implement a program of care to study the environmental, safety and health related public works designed to protect the health and safety of exposed workers, it is essential that the concessionnaires of public works gives the workers safe equipment and provide them with health monitoring, authorities should monitor compliance program to implement business and ensure as much as possible to reduce noise pollution and particulate matter to maintain the environmental conditions associated with the presence of public work.

The Evaluation of Effects of Pollutants Ecosystem Scale and Importance for Environmental Management
WP077. Acute and chronic toxicity of chlorantraniliprole using Ceradaphnia dubia et Raphidocelis subcapitata as test-organisms
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Studies on the effects of toxic agents in aquatic bodies, specially the emerging pesticides, are necessary due to the standardization of environmentally safe compounds. The pesticide Chlorantraniliprole (Sigma-Aldrich, 99 % purity) was solubilized in acetone. Dilutions for acute toxicity were 0.88, 1.3, 2.0, 3.0, and 4.5 μg L⁻¹, and for chronic toxicity tests the concentrations 0.16, 0.21, 0.27, and 0.35 μg L⁻¹. To calculate the LC (50) we used the method ”Trimmed Spearman-Kraemer” available in ICIPN program. In chronic tests we compared number of offspring and adults mortality with the control group using Kruskal-Wallis test, using BioStat 5.0. To date, the results showed a LC50 (96 h) 2.7 mg / L, and chronic toxicity testing to establish CENO and CEO, as well as the toxicity test with algae are underway. Keywords: Chlorantraniliprole, pesticide, toxicity, Raphidocelis subcapitata, Ceridophida dubia. References: ABNT - ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. Toxicologia aquática - Toxicidade crônica - Método de ensaio com Ceridophida spp (Custraca, Cadchroa). 2011. ABNT - ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. Toxicologia aquática - Toxicidade crônica - Método de ensaio com algas (Chlorophyceae), 2011. EPA – ENVIRONMENTAL AGENCY PROTECTION. Technical Overview of Ecological Risk Assessment Analysis Phase: Ecological Effects Characterization EPA (2014-06-24). Disponível em http://www.epa.gov/opedfed/ecosk_ders/oera_analysis_eco.htm Acesso em 06/07/2014.

WP078. Aquatic plants in the reduction of organic loadings of wastewaters R.D. Lopes; R.S. Andrade, UESC- Universidade Estadual de Santa Cruz; J.R. Dutra, UESC- Universidade Estadual do Sudoeste da Bahia; L.R. Rodrigues, UESB- Universidade Estadual do Sudoeste da Bahia; L.A. Almeida Neto, State University of Santa Cruz - UESC / Department of Agricultural and Environmental Sciences DCUA

Aquatic plants have been proposed for contaminants removal in various types of waste, such as domestic sewage and agro-industrial effluents. Considered an emerging technology, Wetlands are shallow lagoons where aquatic plants grown in the effluent. Pondering the polluting power of the dairy wastewater and legal restrictions on its disposal in the environment, this research aimed to identify and evaluate native aquatic plants in the region, for the treatment of wastewater dairy. Were identified and collected on the Cachoeira river, located in Itabuna city-BA, three species of aquatic plants, using two different wastewater dilutions from a medium sized dairy, and two control systems, without the presence of plants. Dilution was carried out with storm pluvial water collected in the dairy itself. Experiments were conducted within sixteen days, taking place every four days for the following analyses: Chemical Oxygen Demand - COD, total solids, pH and temperature. The pH of around 7 and the temperature between 26-28 °C maintained stable and favorable conditions for plant growth during the experiment. The Pistia stratiotes did not survive the effluent organic load, even with dilutions, and died after seven days run-off of the experiment. While Polygrammon sp. and Eichhornia paniculata could adapted the conditions in all systems achieving on the eighth experiment day a maximum reduction of COD rates of 97.5% and 89.9%, respectively, compared to initial COD rates of the system. Regarding control systems, for the same dilution, the reductions were in the order of 58.3% for Polygrammon sp. and 66.7% for Eichhornia paniculata. The total solid rates had greatest reductions on the fourth experiment day with a reduction of 32.2% for Polygrammon sp. and 26.4% for Eichhornia paniculata compared to the initial system rates. It was concluded that aquatic plants could be efficient in removing COD in dairy wastewater with energy and fertilizer potential, using aquatic plants adapted locally. Specifically, in this experiment, the Eichhornia paniculata plant stood out on reducing organic loading of dairy wastewater. 

WP079. Assessment of sediment toxicity on a coastal marine area under dredging activities using sea urchin embryo-larval bioassay L.C. Medeiros, UNIVERSIDADE VILA VELHA - UVV / Applied Ichthyology Laboratory; E. Carvalho, Universidade Vila velha / Applied Ichthyology Laboratory; V. David Castelole, UNIVERSIDADE VILA VELHA UVV / Applied Ichthyology Laboratory; A. Chippari Gomes, Universidade Vila velha / Applied Ichthyology Laboratory

In recent years, the State of Espírito Santo, southern Brazil, has undergone rapid economic development and national and international companies have settled ports along its coast. These endeavors require underwater dredging activities during the implementation phase, which can generate greater contamination in coastal areas by bottom sediment resuspension, leading to increases in bioavailability of adsorbed contaminants and affect inhabiting aquatic species. The use of biological indicators in monitoring programs has become very important and the sea urchin toxicity bioassays are recognized to be sensitive and reliable. They are standardized tools and applied worldwide in evaluating the quality of sediment and its potential effects on the coastal marine environments, due to resuspension phenomena during dredging and the dumping of material.

Thus, in this study we assess the impact of dredging activities in a tropical coastal area through a sea urchin (Echinometra lucunter) monitoring during a shipyard construction. For this purpose, sediment samples were collected in study areas before (BEF) and during (DUR) the dredging activities on marine substrate. The protocol used was powdered exposure test, followed by the sea urchin Test of Preservation Procedure and Sample Preparation (ABNT - NBR 15469) and follows the ABNT - NBR 15350 test method for sea urchin (Echinofermata: Echinodera) / 2006. Our results show that all samples tested caused adverse effect on larvae of E. lucunter, since the normal survive larvae rate was less than 80% (EC50). It is also possible to observe a significant increase (≤ 5SD) in the rate of adverse effect on larvae compared to the period before the dredging. This indicates that these pollutants contained in the sediment were possibly scattered in the environment making it bioavailable again in the water column during the dredging process. Financial support: FAPES, UVV.

WP080. Biomonitoring water genotoxicity of wetlands in the Sinos River Basin, southern Brazil V. Severo, Universidade Feevale / Programa de PósGraduação em Qualidade Ambiental; D. Peixoto, Instituto de Ciências da Saúde; M. Miyave, Universidade Feiavel / Instituto de Ciências da Saúde; A. Droste, Universidade Feiavel / Programa de PósGraduação em Qualidade Ambiental

The wetlands of the Sinos River Basin (SRB) located in northeastern Rio Grande do Sul, Brazil, are subject to serious human impacts from intense urbanization and industrialization, which can compromise the physical, chemical and biological quality of the ecosystems. The aim of this study was biomonitoring the water quality in wetlands in the SRB by assessing the genotoxic potential in the aquatic plants Tradescantia pallida D.R. Hunt var. purpurea Boom. In October 2014 and January 2015, 300 tetrads were observed per slide, in the wetlands of the Sinos River Basin, southern Brazil, are subject to sewage and agro-industrial effluents. Considered an emerging technology, Wetlands are shallow lagoons where aquatic plants grown in the effluent. Pondering the polluting power of the dairy wastewater and legal restrictions on its disposal in the environment, this research aimed to identify and evaluate native aquatic plants in the region, for the treatment of wastewater dairy. Were identified and collected on the Cachoeira river, located in Itabuna city-BA, Brazil. Pistia stratiotes, Polygonum sp. and Eichhornia paniculataplants. Eight plastic systems of 10 Leach, simulating Wetlands, were assembled with plastic buoyant supports to introduce three species of aquatic plants, using two different wastewater dilutions from a medium sized dairy, and two control systems, without the presence of plants. Dilution was carried out with storm pluvial water collected in the dairy itself. Experiments were conducted within sixteen days, taking place every four days for the following analyses: Chemical Oxygen Demand - COD, total solids, pH and temperature. The pH of around 7 and the temperature between 26-28 °C maintained stable and favorable conditions for plant growth during the experiment. The Pistia stratiotes did not survive the effluent organic load, even with dilutions, and died after seven days run-off of the experiment. While Polygrammon sp. and Eichhornia paniculata could adapted the conditions in all systems achieving on the eighth experiment day a maximum reduction of COD rates of 97.5% and 89.9%, respectively, compared to initial COD rates of the system. Regarding control systems, for the same dilution, the reductions were in the order of 58.3% for Polygrammon sp. and 66.7% for Eichhornia paniculata. The total solid rates had greatest reductions on the fourth experiment day with a reduction of 32.2% for Polygrammon sp. and 26.4% for Eichhornia paniculata compared to the initial system rates. It was concluded that aquatic plants could be efficient in removing COD in dairy wastewater with energy and fertilizer potential, using aquatic plants adapted locally. Specifically, in this experiment, the Eichhornia paniculata plant stood out on reducing organic loading of dairy wastewater.

WP081. Caracterização da qualidade da água e presença de agentes t
O crescimento desordenado e a falta de planejamento na gestão urbana da Ilha de Santa Catarina (Florianópolis) têm acarretado consequências desastrosas nos seus ecossistemas aquáticos. Para que a recuperação e restauração na Bacia Hidrográfica do Rio Icaraíbu seja eficaz, o objetivo deste trabalho foi de realizar o monitoramento quantitativo e qualitativo desse recurso hídrico, utilizando-se de análise de parâmetros físico-químicos e biológicos para identificação de possíveis impactos ambientais. Para tanto, foram realizados amostragens de água de 4 sitos, nos rios Sertão e Icaraíbu os quais são interligados e fazem parte da Bacia Hidrográfica do Icaraíbu. Os parâmetros físico-químicos foram feitos de acordo com Standard Methods for the Examination of Water and Wastewater e American Public Health Association (APHA, 2005). Os testes de toxicidade aguda com Daphnia magna foram realizados segundo aNBR 12.713 (ABNT, 2003a). Os bioensaios com Scenedesmus subspicatus foram realizados de acordo com ISO 8692 (ISO, 2012). Os resultados preliminares obtidos com os parâmetros físico-químicos analisados demonstraram um valor mais elevado para amônia e para o fósforo e uma significativa alteração no número de coliformes fecais, o que indica contaminação por exágro doméstico. Nos testes de toxicidade aguda com Daphnia magna, as taxas de mortalidade observadas foram de 23% a 66%, para os diversos sitos sendo que apenas para o sitio 4 foi possível calcular a EC50 – 55,48%. Os bioensaios com as algas observou-se uma taxa de crescimento 28% maior que no controle em todas as amostras, o que indica tendência a eutrofização. Análises cromatográficas por GC/MS estão em andamento visando identificar a presença de possíveis poluentes, em especial fármacos.

**WP082. Chlorella vulgaris: efeitos de um formulado comercial de 2,4-diclorofenoacético e eficiência na remoção.**


El presente trabajo tuvo como objetivo evaluar el efecto de un formulado comercial de ácido 2,4-diclorofenoacético (2,4-D) sobre Chlorella vulgaris y la eficiencia en la remoción de este compuesto en soluciones acuosas. Las microalgas fueron cosechadas en fase de crecimiento exponencial, centrifugadas y re suspendidas en agua ulra pura estéril. Se ensayaron 5 concentraciones reales de 2,4-D comprendidas entre 4,34 y 283,36 mg L⁻¹ y un control, todos triplicados. La densidad celular (cel.ml⁻¹) se cuantificó directamente por conteo en cámaras de Neubauer. Los ensayos duraron 96 h y se realizaron con iluminación continua (6000 lux), 22± 1°C y una concentración inicial de 10000 cel.ml⁻¹. Se tomaron alícuotas de 100 ml a las 96 h para calcular la concentración efectiva 50 (CE50-96h) y la concentración de clorofila-a (μg.l⁻¹). Las diferencias entre los controles y tratamientos se analizaron con ANOVA (p<0.05). Para evaluar la eficiencia de remoción de 2,4-D, se determinaron las concentraciones reales al inicio y al final del ensayo. La CE50-96h fue 29,02 mg L⁻¹. En concentraciones de 2,4-D en el rango de 43,4 - 354,5 mg L⁻¹, la clorofila-a fue un 20% más alta que en el control. En cuanto a la capacidad de remoción, la mayor eficiencia se observó cuando C.vulgaris fue expuesta a concentraciones iniciales de 4,34 mg L⁻¹ obteniendo 34,25 % de remoción a las 96 h. Este trabajo aporta información relevante sobre la importancia de evaluar la toxicidad de las formulaciones comerciales y no sólo el principio activo. Se recomienda que en los marbetes de aguas urbanizadas estén presentes la ICYTAC DPTO QUÍMICA ORGÁNICA FACULTAD DE CIENCIAS QUÍMICAS, M. Mongeirran, Universidad Nacional de Córdoba.

**WP083. Differentiation and characterization of three lakes in Córdoba (Argentina) using carbon and nitrogen stable isotopes**

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Stable isotopes have become useful for tracing food webs and stimulating nutrient and energy flow in aquatic ecosystems. Therefore, this analysis is a promising tool for monitoring changes in the contribution of human N sources as an effective and direct indicator of human N pollution, providing further information for the identification of sewage pollution. Based on stable isotope analysis as chemical markers, this study aims at finding methods that could be reliably used to understand the impact of potential pollutants on aquatic ecosystems. For this reason, we measured 813C and 815N values in different abiotic matrices, like water and sediment, and in diverse organisms, from primary producers to upper consumers. Considering our goal, the three most important lakes in Córdoba were sampled: San Roque (SR), Los Molinos (LM) and Río Tercero (RT). Several activities conducted in the surroundings of these lakes can be sources of different pollution. The SR Lake supplies drinking water to Córdoba city, and it is also intended for recreational use. It is surrounded by cities and settlements which are not fully connected to the public sewerage system. The LM Lake provides water to the southeastern area of the city of Córdoba and is used for recreational activities and irrigation. The RT Lake is the largest artificial reservoir in the province of Córdoba, and it is used for water supply and industrial activities, as well as for providing cooling water for a nuclear power plant. Samples of water, sediment, plankton, shrimp (Palaemonetes argentinus) and fish (Odontesthes bonariensis) were collected from each lake. Stable isotope analyses were performed in an Isotope Ratio Mass Spectrometer (IRMS), connected to an elemental analyser (both Thermo Fisher Scientific). The results indicated notorious differences in 613C and 615N between samples in the studied lakes, showing the ability to identify lakes exposed to anthropogenic sewage. All samples from the SR Lake presented the highest 615N values, indicating that this lake has the greatest influence of sewage on the lake ecology. It is worth mentioning that the information provided by our analysis is not exhaustive, and further research studies are necessary to confirm this preliminary result, whether it is possible to link sewage discharges with levels of stable isotopes in biota, including edible fish, allowing to point out the risk for people drinking water or eating fish from such impacted lakes.

**WP085. Ecotoxicological Assessment in Sechura Bay - Piura, Peru, 2014.**


As part of the project “Assessment and determination of the environmental impacts of the main productive activities in Sechura Bay and surrounding areas, 2014” presented by the Functional Area of Coastal Marine Research of the General Direction of Aquaculture Research of the Sea Institute from Peru, Laboratory of Aquatic Ecotoxicology, raised determine toxicity levels in samples of water and sediment Sechura Bay. In addition, a sensitivity test using potassium dichromate was performed in the “scallops” Argosteg cyanopterus, own of the location area. For the study 20 sampling stations located in the coastal
Efectos de plaguicidas sobre la riqueza zooplanctónica de arroyos de Santa Fe (Argentina)


En este trabajo se seleccionaron cuatro formulados de glifosato y dos cladoceros: Daphnia magna y Ceriodaphnia dubia con el objetivo de: 1) determinar la concentración efectiva 50 (LC50) a los 48 h de los cuatro formulados 2) estimar efectos potenciales sobre la dinámica poblacional de D.magna y C.dubia mediante un análisis de Monte Carlo para D.magna y C.dubia el valor medio de λ también fue 1, excepto en el Roundup Ultramax® donde fue: 1.30 y 1.20 para 1 y 2.5 e.a mg L⁻¹ respectivamente. Este trabajo aporta información relevante sobre la importancia de evaluar la toxicidad de las diferentes formulaciones de glifosato utilizando modelos biológicos, representativos de los sitios. Además, se destaca el desarrollo de parámetros integradores que puedan ser utilizados en las evaluaciones ecotoxicológicas de las formulaciones, así como en la gestión del medio ambiente incorporándolos para establecer valores guía para la protección de la biota acuática.


As part of the project “Assessment and determination of the environmental impacts generated by the main productive activities in Titicaca Lake and surrounding areas, 2014” presented by the Functional Area of Coastal Marine Research of the General Direction of Aquaculture Research of the Sea Institute from Peru, Laboratory of Aquatic Ecotoxicology, raised determine toxicity levels in samples of water and sediment Titicaca Lake. In addition, a sensitivity test using potassium dichromate was performed in the "trouts" Oncorhynchus mykiss, own of the location area. For the study 18 sampling stations located in the coastal zone 14 sampling stations in beach areas and 07 sampling stations arranged in zones of rivers they were considered. The first survey was conducted in June 2014 and the second one was conducted in October of the same year. For ecotoxicological tests on samples of epipelagic origin Daphnia magna neonates were used. Both tests were arranged based on a battery of dilutions (100%, 50%, 25%, 12.5% and 6.25%) from environmental samples carried soluble medium, facing the test organisms to exposure periods 48 h reporting survival. The experimental test followed a completely randomized block design (RCBD) with 5 levels, 4 replicates, a negative control and a positive control (potassium dichromate). The results of the ecotoxicological tests showed levels of “slight toxicity” associated with 5 coastal resorts such as San Pedro, Parachique, Matacaballo, Playa Blanca and zones in front of fishmeal plants. Susceptibility testing in the “scallops” Argopecten purpuratus showed a LC50 of 31.7 (22.0 to 45.6) mg/L. It is recommended to continue the study of sensitivity and monitoring of these stations in older times that can reflect the impacts in times of increased anthropogenic influence or seasonal changes that can demonstrate the dynamic of potential pollutants. Finally, the use of percentage scales the median lethal concentration is discussed dilutions of environmental matrices tested in this study.
insecticides consists in the inhibition of acetylcholinesterase enzyme. In the present work different biochemical and reproductive effects were studied in Biomphalaria straminea, a freshwater gastropod naturally distributed in Argentina, after a subchronic exposure (14 days) to environmental concentrations of the OP azinphos-methyl (AZM). Bioassays were performed in 250 mL glass vessels housing 3 snails each. Six vessels were used for each treatment: water control, current control (acetone), 20 and 200 µg/L AZM. Organisms were fed every 7 days and insecticide solutions were renewed every 4 days. After 14 days, soft tissues of the 3 snails from each recipient were homogenized together and centrifuged at 11,000 g. In the supernatant fraction, cholinesterase (ChE) activity was measured using acetyltiosalicylic and carboxylesterase (CE) activity with p-nitrophenyl acetate and p-nitrophenyl butyrate as substrates. Along the 14 days each egg mass was transferred to individual containers, where it received the same treatment as adults until hatching. Following parameters were registered: number of egg masses, number of eggs per egg mass, number of eggs with embryo per egg mass, time to hatching and number of hatchings per egg mass. When hatching, juveniles were transferred to clean water and survival was recorded over a month. Results showed a strong inhibition in the activity of ChEs with both substrates. The activity of the enzyme decreased around 60% with 200 µg/L AZM respect to control. By contrast, CE activity, in spite of being the primary target of OPs, did not show inhibition after 14 days of exposure. Reproductive parameters analyzed were not statistically different from control, although many egg masses starting from 20 and 200 µg/L AZM treatments showed arrested embryonic development at early stages and some juveniles coming from the highest AZM concentration hatched with different morphology than controls. Offspring survival from 200 µg/L AZM treatment was 16% lower than control. CEs can be used as a sensible biomarker after subchronic exposure to AZM in B. straminea. Offspring survival could be included in further studies as possible effect biomarkers. The decrease in survival could lead to a decline in the number of organisms of a species which may threaten the integrity of natural ecosystems.

WP091. Evaluación de efectos genotóxicos del insecticida Imidacloprid en el ciclado sudamericano Australoheros facetus.

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El sistema agropecuario actual conlleva la utilización de grandes cantidades de plaguicidas, los cuales pueden llegar a los ecosistemas acuáticos y producir efectos negativos en la biota. El Imidacloprid (IMI) es un insecticida neonicotinoide que actualmente está siendo reevaluado en la Unión Europea por sus posibles efectos tóxicos sobre polinizadores. Sin embargo, pese a ser un compuesto hidrofílico (log kow 0,57) de uso actual, los estudios sobre efectos en biota acuática son menos frecuentes. El objetivo de este trabajo fue evaluar la genotoxicidad del IMI en el pez Australoheros facetus, a partir de biomarcadores citogenéticos. Se realizó una exposición aguda de 24 hs al IMI, como ingrediente activo, utilizando 1, 10, 100, y 1000 µg/L IMI y se evaluaron las frecuencias de micronúcleos (MN) y otras anormalidades nucleares (AN) (totales, “lobed”, “blebbed” y “notched”) en sangre periférica. Las frecuencias de MN y de AN “lobed” se incrementaron significativamente a 1000 µg/L IMI, mientras que los otros biomarcadores de genotoxicidad no evidenciaron cambios respecto al control. Estudios anteriores llevados a cabo en nuestro grupo de trabajo en peces expuestos al formulado comercial IMIDA NOVA® evidenciaron un incremento de la frecuencia de MN a partir de concentraciones de 100 µg/L IMI. Los resultados de este estudio permiten concluir que el ingrediente activo IMI es genotoxic en A. facetus, siendo menos potente que el formulado comercial ensayado. 

WP092. Evaluación toxicológica de las aguas de los ríos Tunúyán y Mendoza (Mendoza) mediante el empleo de C. elegans

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El acceso al agua de buena calidad es un factor esencial para garantizar el desarrollo socio-económico, asegurar el bienestar del hombre y de los ecosistemas. Sin embargo, producto de las actividades antrópicas los recursos hídricos se encuentran altamente amenazados por la presencia de múltiples contaminantes. La determinación de parámetros clásicos de calidad resulta insuficiente para hacer una evaluación integral de la calidad, por lo que resulta indispensable incorporar en los planes de monitoreo bioensayos ecotoxicológicos. Se propone el uso del nemático Caenorhabditis elegans como modelo biológico válido ya que el mismo permite integrar diferentes niveles de análisis, desde el molecular hasta el comportamental. Este modelo podría emplearse para la detección temprana de efectos adversos sobre las comunidades acuáticas como su posible impacto en la salud de la población producto de la exposición a las aguas contaminadas. En este trabajo se presentan resultados preliminares del análisis del efecto tóxico en muestras extraidas en los ríos Mendoza y Tunúyán de la Provincia de Mendoza. El estudio se basa en muestreos mensuales (marzo-diciembre 2014) sobre ocho sitios seleccionados Se analizaron parámetros fisicoquímicos y biológicos de acuerdo al Standard Methods. Los parámetros fisicoquímicos fueron empleados para el cálculo de un Índice de Calidad de Agua. Asimismo, se evaluó el crecimiento de C. elegans en bioensayos estandarizados para determinar la toxicidad en las muestras mencionadas. Se realizó un análisis de contingencia y modelación estadística para determinar cómo varían los Índices de Calidad del Agua en relación con los parámetros toxicológicos. Los resultados indican que a medida que los valores de los Índices de Calidad del Agua disminuyen también disminuye el crecimiento del nemátodo, existiendo una correlación positiva entre ambas variables. Sin embargo, algunas muestras calificadas como de Calidad “aceptable” resultaron ser moderadamente tóxicas. Este trabajo destaca la relevancia de evaluar la calidad del agua en forma integral.

WP093. Marine debris: implications for conservation of rocky reefs in Manabi, Ecuador

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Management of marine debris (MD) is a problem of global concern due to its impacts on the diversity and marine productivity. Current situation of MD and its implications in the conservation of marine ecosystems are completely unknown in the continental coast of Ecuador. Composition and distribution of submersed MD were evaluated in two rocky reefs in the province of Manabi by diurnal underwater surveys with time transects and considering three geomorphological areas: crest, slope and bottom. Observed items of MD were classified in 8 categories according to their source and use. Density of MD was expressed as items of MD km-2. Plastic consumers and monofilament nets showed highest frequencies of occurrence in study sites. 63% of MD items at both sites were associated to fishing activities. MD averages showed significant difference between sites. A strong correlation between distribution of MD categories and geomorphological zones and sites was found. Disposal of MD items was determined by the influx of visitors and fishing activities at sites; with accumulation and distribution were modulated by direction and intensity of ocean currents and spatial orientation of the reefs. We recommend establishing a sampling protocol in order to allow spatio-temporal variability assessment of the MD. The resulting information would be very useful for a proper management of the MD and would support the implementation of conservation and recovery programs towards affected marine ecosystems.

WP094. Non-essential metals in water, sediments and tissues of fish from different trophic levels in Río Tercero Reservoir (Córdoba, Argentina).

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Non-essential metals are found in the environment and have not any biological activity associated. The continuous increase of these metals by anthropogenic activities, turn them in contaminant. These elements are characterized by a long persistence, high toxicity and a poor degradation. When they enter into the aquatic environment, they are absorbed by the sediments, and can be accumulated by the aquatic organisms. These organisms can take metals from water through the gills, skin or intestine. The aim of this study was to determine non-essential
metals concentration in water, sediments and organs of fish (Rhamdia quelen, Oligosarcus jennysi, Odontesthes bonariensis) from different trophic levels in Río Tercero Reservoir. Sampling was conducted in winter season at two sampling sites with different anthropogenic impact (tourist and drainage channel of the Embalse Nuclear Plant). The metals concentration (As, Cr, Cd, Hg, Pb and Sr) in abiotic matrices (water and sediment) and different organs (gills, intestine, live and one of these studies was determined whether the difference was due to registered Pb and Sr. In sediments, all metals were registered except Cr and As. There were no differences between sampling sites in the abiotic matrices. With regards to fish, all metals were registered in fish organs. The measured concentration of the metals varied with the fish species and with the organs. In R. quelen, intestine accumulated the highest levels of all studied metals except for Hg and As which presented the highest levels in gills and liver respectively. O. jennysi and O. bonariensis showed no significant differences in metals accumulation between organs, except Sr, that presented the highest concentration in gills for both species, and Hg and Sr that registered the highest levels in liver of O. jennysi and O. bonariensis respectively. If metals concentration in all organs is considered then R. quelen (“fish that frequent the bottom”), was the species that more metals accumulated, because it is in direct contact with the sediment, matrix where the metals are mainly concentrated. On the other hand, O. jennysi and O. bonariensis presented the lowest accumulation of these elements. These species inhabit “open waters”, being predator and planktophagous respectively. The different habits that have the studied species would impact on the differential accumulation of non-metallic elements in the analyzed organs.

WP095. Osmoregulatory changes in Anodontites trapesialis subject to in situ and laboratory tests: the effects of contaminants associated with coal mining

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Coal mining generates wastes such as the acid mine drainage, which in association with metals and other pollutants, are a major problem for aquatic organisms. Thus, the objective of the study was to perform tests in situ and in laboratory to determine the osmoregulatory effects of coal mining-related contaminants in the bivalve Anodontites trapesialis. Individuals of A. trapesialis were collected from a fish farming tank and acclimated for 10 days at the laboratory. When the animals were then exposed to both points located upstream of the mine (M1 and M2) and two points located downstream of the mine (J1 and J2). In the laboratory experiments, the animals were exposed for 96 h, to different concentrations of Zn (0.18, 1.0 and 5.0 mg L−1), manganese (0.1, 0.5 and 5.0 mg L−1) and a mixture of these two metals (1.0 mg L−1 Zn + 0.5 mg L−1 Mn) in the absence and in the presence of iron (5.0 mg L−1). After exposures, the animals were weighed and sampled for the analysis of osmolytes and ion concentrations (Cl−, Na+, K+, Ca2+, Mg2+) in the hemolymph and for the determination of Na+/K+−ATPase (NKA) activity in the gill and mantle. Animals exposed in situ test showed an increase in weight (J1), reduction in osmolality and concentration of Cl−, Na+ and Mg2+ (J1 and J2) and increased Ca2+ (J1). Animals kept at J1 also showed an increase in gill NKA. Animals exposed to Zn showed a decrease in weight (Zn 1 and Zn 5), osmolality and concentration of Cl− (Zn 1 and Zn 5) and Mg2+ (Zn 5) and increased Ca2+ (Zn 0.18, Zn 1 and Zn 5). In the experiment with Mn we only observed a significant reduction in Cl− in bivalves exposed to 0.5 and 5.0 mg L−1. Animals exposed to mixtures showed a significant decrease in osmolality (Zn+Mn and Zn+Mn+Fe) and Na+ (Zn+Mn), while animals exposed only to iron showed a decrease in Ca2+. Taking together, these results indicate that the coal mining effluents in the stream studied, as well as some isolated metal such as Zn, promote osmoregulatory changes in A. trapesialis that may compromise their survival in the environment.

WP096. Sandy rivers across continents: the impact of sediment pollution on invertebrates - The Berg River Case study

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A collaborative study between the Council for Scientific and Industrial Research (South Africa) and the International Institute of Limnology (Argentina) aims to develop new tools to evaluate the impact of certain human induced pollution on South Africa’s Berg River. This study is of particular significance since the Berg River plays an important role in the economy of the Western Cape, a province of South Africa. The main source of pollution in the Berg River comes from informal settlements located in close proximity to the river, as well as raw sewage originating from sewage treatment works that often end up in the river. The upper and middle river catchment also supports intensive agricultural activities that often cause pollution in the river. Field investigations were carried out focusing on the following objectives: firstly to determine the correct invertebrate sampling methodology and thereafter to use the same to determine the metal composition at selected sites; to determine the accumulated sediment pollution at each site (e.g. metals and nutrient enrichment) and to identify invertebrate biomarkers. The most appropriate univariate and multivariate statistical analyses were used to interpret the data obtained. The results from the metal analysis showed variability which was representative of the nearby land use activities, whilst very low levels of nutrients where found throughout. The measurement of the different pollutant end points are very season specific, as certain activities (i.e. agriculture) only have significant impacts during certain times of the year. This was also evident from the results found thus far. Through this study we hope to describe a macroinvertebrate sensitivity index for the Berg River which may aid in improved catchment management of the Berg River.

WP097. Tissue distribution of persistent organic pollutants in Pontoporia blainvillei accidentally caught in fishing operations in southeastern Brazil

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Persistent organic pollutants (POPs) are well known to accumulate high concentrations in the fatty tissues of marine top predators, such as cetaceans. The franciscana dolphin (Pontoporia blainvillei) is a small cetacean with a distribution restricted to the southwest Atlantic Ocean. This species inhabits mainly shallow waters without any wide range migration and feed on fish, cephalopods, and crustaceans. Cetaceans have a reduced capacity to metabolize PCBs and DDTs when compared to terrestrial mammals, allowing biomagnifications through the food chain. Several studies have reported high levels of POPs in the blubber of cetaceans but information on the tissue distribution of POPs in franciscana dolphin is scarce. Such as the fat reserves in the blubber are mobilized in starved or ill animals, the concentrations of lipophilic pollutants are enriched in other tissues, particularly the liver. Therefore, the investigation of contaminants in liver, kidney and other tissues is also important for toxicological assessment. The aims of this study were to evaluate the distribution and the accumulation of POPs in different tissues (blubber, liver, kidney and muscle) of 16 franciscana dolphins collected on the southern coast of São Paulo between March 2012 and June 2014. The median concentrations (ng g−1; wet weight) in blubber, liver, kidney and muscle of the POP classes analysed were, respectively: PCBs (987; 19.2; 5.08; 4.41); DDTs (550; 10.3; 2.67; 1.89); PBDEs (327.2; 0.230; 0.095; 0.050); Mirex (21.5; 0.457; 0.168; 0.083); HCB (15.4; < 0.360; < 0.360; < 0.144); HCH (< 0.007; 0.20; 0.218; 0.017); HCH (0.145; 0.007; 0.025; 0.007). The Blubber showed a significant correlation (Kruskal–Wallis, p<0.07) with the other tissues studied for PCBs, DDTs and PBDEs suggesting its representativeness for evaluation of these POPs in franciscana dolphin.

WP098. Trastescantia pallida var. purpurea for genotoxicity assessment of water bodies: distilled water for flower bud adaptation and recovery

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Biomonitoring of water genotoxicity by Trastescantia pallida D.R. Hunt var. purpurea flower buds with young inflorescences is carried out in three steps, named adaptation, exposure and recovery. In the first and last steps, cuttings were partially submersed in Hoagland nutrient solution. The use of distilled water instead of this solution may be a practical and less expensive alternative. However, it must be demonstrated that distilled water does not interfere in the results of the bioassay, both when polluted water and negative control samples are evaluated. The aim of this study was to compare the effectiveness of distilled water (T1) and Hoagland solution (T2) as immersion solution used for T. pallida var. purpurea cuttings in the adaptation and recovery steps of the micronuclei bioassay. For each treatment, 20 cuttings with flower buds were collected in October 2014 and January 2015. The cuttings were adapted for 24 h in vessels containing 2 L of distilled water (T1) or Hoagland solution (T2), and
subsequently exposed for 8 h in 2 L of water sample from a wetland located in the municipality of Campo Bom, southern Brazil. After exposure, the cuttings were recovered in 2L of T1 or T2 for additional 24 h. Negative controls were carried out simultaneously by replacing the water sample from the wetland by distilled water (C1) or Hoagland solution (C2). The inflorescences were fixed in ethanol/acetic acid and stored in 70% ethanol at 4°C. The floral buds were dissected, seven slides were prepared for each treatment, and tetrads were analyzed for minornuclei (MCN). The MCN frequency (MCN/100 tetrads) was estimated from 300 tetrads per slide. Mean frequencies of MCN were compared by the Student t test (p=0.05). For both samplings, no significant differences were observed between MCN frequencies recorded for both treatments with water from the wetland (October 2014: T1=3.2 and T2=2.4 (p=0.236), January 2015: T1=5.2 and T2=4.7 (p=0.732)), as well as for negative controls (October 2014: C1=1.1 and C2=0.9 (p=0.598), January 2015: C1=1.6 and C2=2.4 (p=0.109)). The results showed that the replacement of Hoagland solution by distilled water as immersion solution for T. pallida var. purpurea cuttings does not interfere with the response of the plants to water conditions to which they are submitted during the bioassay.

Environmental Contaminants and Reproductive Effects

WP099. Alteração da capacidade reprodutiva de zebrafish promovida pela exposição a efluentes de indústria de papel e celulose

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Diversos compostos tóxicos, apontados como desreguladores hormonais, são componentes de efluentes de indústrias de papel e celulose gerados durante a produção de polpas celulósicas, em concentrações variáveis, dependendo do tipo de processo empregado. Efluentes de indústrias de papel e celulose são internacionalmente reconhecidos como altamente deletérios com propriedades para alterar a capacidade reprodutiva de peixes. O objetivo do presente estudo foi avaliar a produção de ovos e a viabilidade dos mesmos, bem como o desenvolvimento embrionário de zebrafish expostos aos agentes tóxicos existentes nos efluentes de indústria de papel e celulose. Os efluentes testados - tratado e não tratado pela indústria - são do processo de produção de polpas não branqueadas utilizando Pinus. Os peixes foram pré-expostos ao efluente diluído (1/25), em aquários de 3,5 L, mantendo-se machos e fêmeas separados, por 7 dias, 28ºC e um ciclo claro/escurio de 12/12 h. Após o período de pré-exposição, machos e fêmeas foram acasalados (1 casal por Becker contendo uma rede no fundo) e acompanhados durante 6 dias, com renovação diária de água/poulette e alimentados 1 vez ao dia. Os ovos foram coletados e acondicionados em placas contendo o agente teste, mantidos protegidos da luz. Para ambos os efluentes testados, observou-se uma redução significativa na produção de ovos, de 75% e 85%. Dos ovos produzidos, um percentual elevado, com clara relação com a concentração do agente teste, apresentou coloração escura, caracterizando-se como alimentados. Os ovos foram desenvolvidos até a formação de alevinos, observou-se uma redução significativa na produção de alevinos, de 75% e 85%.

WP100. Desregulação hormonal em peixes capturados no Rio Canoas, SC, Brasil

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O rio Canoas é um dos mais importantes do estado de Santa Catarina, Brasil. Diversos estudos têm sido realizados em trechos deste rio, em especial, nos municípios de Correia Pinto e Ponte Alta, demonstrando que poluentes estão sendo lançados nas suas águas, provocando alterações fisiológicas e bioquímicas em peixes mantidos em gaiolas. O presente estudo avaliou a produção de ovos e a viabilidade dos mesmos, bem como o desenvolvimento embrionário de peixes expostos aos agente tóxicos existentes nos efluentes de indústria de papel e celulose. Os efluentes testados - tratado e não tratado pela indústria - são do processo de produção de polpas não branqueadas utilizando Pinus. Os peixes foram pré-expostos ao efluente diluído (1/25), em aquários de 3,5 L, mantendo-se machos e fêmeas separados, por 7 dias, 28ºC e um ciclo claro/escurio de 12/12 h. Após o período de pré-exposição, machos e fêmeas foram acasalados (1 casal por Becker contendo uma rede no fundo) e acompanhados durante 6 dias, com renovação diária de água/poulette e alimentados 1 vez ao dia. Os ovos foram coletados e acondicionados em placas contendo o agente teste, mantidos protegidos da luz. Para ambos os efluentes testados, observou-se uma redução significativa na produção de ovos, de 25% e 85%. Dos ovos produzidos, um percentual elevado, com clara relação com a concentração do agente teste, apresentou coloração escura, caracterizando-se como alimentados. Os ovos foram desenvolvidos até a formação de alevinos, observou-se uma redução significativa na produção de alevinos, de 75% e 85%.

WP101. Effects of estrogens in environmentally relevant concentrations on kiss2 and kiss2rb expression in pejerrey fish brain, pituitary and testes

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Environmental estrogenic compounds can interfere with the endocrine system and adverse developmental and reproductive effects in animals. Estradiol (E2) and 17α-ethinylestradiol (EE2) contribute to the estrogenic activity in water bodies all over the world. During the last years, a more inclusive concept has emerged: neuroendocrine disruption, in order to include the full breadth of integrative physiology. So, we aimed to study the neuroendocrine kisspeptin (kiss), known to control reproductive function in vertebrates. For example, in Danio rerio and Carassius auratus kisspeptin mRNA expression in the brain is increased after E2 treatments and putative binding sites for estrogen receptors (ERs) have already been characterized in kisspeptin and kisspeptin (kissr) receptor promoter regions. In the most recent species, the kisspeptin system is composed by two ligands (kiss1 and kiss2) and two receptors (kiss2rb and kiss3rb); and it is known that kiss2/kiss2rb are related to gonadal maturation. In this context, the main of the present study was to evaluate the effects of E2, EE2 and their mixture on kiss2/kiss2rb mRNA expression in the Brain-Pituitary-Testicular axis of pejerrey. To accomplish this goal, five adult males were maintained in 60 L tanks during 14 days, using a static exposure system (by duplicates). Fish were exposed to 350 ng/L of E2 and 45 ng/L of EE2, and the mixture of both estrogens at the same concentrations, and the controls were added every two days in order to keep their concentration constant. At the end of the exposure, fish were anesthetized and sacrificed. A brain section (from the optic tectum to the inferior lobe of the hypothalamus), the pituitary gland and the testes were dissected, total RNA obtained and cDNA was synthetized by reverse transcription reaction. Kiss2 and kiss2rb expression was measured by RT-qPCR, using β-actin and elongation factor 1 as reference genes. The estrogens mixture induced a rise of kiss2 and kiss2rb mRNA expression in the brain, compared to the other treatments. No significant differences in kiss2 or kiss2rb levels were observed in the pituitary gland and testes. These results suggest that estrogenic compounds have a differential action on kiss2/kiss2rb expression depending on the tissue and show, that kisspeptin is a target of endocrine disruption. Further studies must be done to clarify this action, probably mediated by ER response elements in pejerrey as it has already been reported for other teleost.
was kept in cultivation water, followed the recommendations of NBR 13373 (2011). Through Biostat 5.0 software statistical analyzes were conducted with Kruskal-Wallis test (mortality and reproductive parameters) to assess the potential acute and chronic toxicity tests. The concentration of Zn + Cd showed no acute or chronic toxicity and kept very close neonates numbers of the control group. However the environment according to CETESB (2012) the concept is determined lower than the allowed values, showing that the interaction of Zn + Cd E elements can make them more harmful to organisms, presenting significant difference and 33% reduction in the number of neonates in the control group. The results showed that interaction of environmentally safe concentrations for the protection of aquatic life based on existing national legislation did not affect the reproduction of the test organism. However, the interaction of concentrations detected in natural environments Brazilian state of SP have shown to be harmful to the test-organism thus affecting the aquatic ecosystem, acting as endocrine disruptors.

**WP103. Sex Hormone-Binding Globulin Expression During Oogenesis. Its Regulation by Xenosteroids in Pejerrey Fish**

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Sex hormone-binding globulins (SHBGs) are carrier serum proteins involved in the transport of sex steroids in blood. SHBGs are related to reproduction because they regulate the plasma metabolic clearance rate of sex steroids by controlling its bioavailability. It is known that the main expression site of SHBG in teleost fish is the liver, but there is little knowledge about its regulation. In female fish, one of the most important reproductive processes is vitellogenesis, and this process is mainly regulated by the sex steroid 17β-estradiol (E2) synthesized in the ovary. However, the involvement of sex steroids in the regulation of SHBG expression is still under debate in teleosts. Additionally, it is well known that xenosterogens can mimic the actions of endogenous estrogen. In this context, the main objective of this study was to analyze if natural and/or synthetic sex steroids can regulate shbg gene expression. First, shbg-mRNA abundance was assessed in liver during oogenesis in wild fish throughout one sex cycle. Then we assessed the in vitro expression of vitellogenic female liver slices to the following estrogen: E2 and 17α-ethinylestradiol (EE2), and the androgen: testosterone (T) and 5α-dihydrotestosterone (DHT). All steroids were tested at the following concentrations: 0.05, 0.5, 5 and 50 ng/ml. The results showed that shbg-mRNA abundance varied throughout pejerrey oogenesis, with the highest levels at pre-vitellogenesis and lowest at advanced vitellogenesis stages. The expression of shbg showed negative correlations with plasmatic sex steroids levels (R=0.8 for E2 and R=0.58 for T), indicating that these steroid could be involved in a negative feedback mechanism. On the other hand, in vitro culture of vitellogenic female liver slices showed that 50% E2 and DHT increased the mRNA abundance, being E2 the most potent steroid (increasing 10 times with respect to basal levels at all concentrations tested). Taken together, these results suggest that shbg gene expression can be regulated by sex steroid and xenosteroids. Thus, the presence of these compounds in the environment could modulate the steroids bioavailability through the regulation of SHBG expression.

**WP104. Study of the performance of potentially toxic metals (Zn and Cd) as endocrine disruptors in ecotoxicological tests with C. dubia.**

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Environmental issues with metallic pollutants is due to the fact that the significant increase in the use of these elements from the twentieth century. Recently in the literature such pollutants are recognized as potential endocrine disruptors (ED) to aquatic biota, resulting in reproductive injury compromising the viability of the species. In the present legislation, the limits of these elements for water protection were not informed on potential endocrine activity. Metals are not easily biodegradable and may occur bioaccumulation or Biomagnification biota, metabolizing or generating irreversible effects (Damstra, 2002; Sodré et al., 2007). Faced with this question, this study aims to evaluate the potential performance of Cd and Zn metals singly as ED, on organism Ceridionphid dubia in chronic exposure, assessing reproductive aspects and viability of generation. The toxicity tests were performed using environmentally safe concentrations for the protection of aquatic life based on present national legislation (CONAMA 357/05) and with concentrations detected in Brazil, representative natural environments in the state of SP (CETESB, 2012). In ecotoxicological test organisms were exposed to concentrations of Zn: 0.18mg/L 0.27mg/L, and Cd: 0.001mg/L 0.005mg/L, while the F1 generation was maintained in environmentally desirable conditions (water cultivation), followed the recommendations of NBR 13373 (2011). Through Biostat 5.0 software statistical analyzes were conducted with Kruskal-Wallis test (reproductive parameters) as parameters to assess the potential acute and chronic toxicity tests. The concentration of Zn + Cd showed no acute or chronic toxicity and kept very close neonates numbers of the control group. However the environment according to CETESB (2012) the concept is determined lower than the allowed values, showing that the interaction of Zn + Cd E elements can make them more harmful to organisms, presenting significant difference and 33% reduction in the number of neonates in the control group. The results showed that interaction of environmentally safe concentrations for the protection of aquatic life based on existing national legislation did not affect the reproduction of the test organism. However, the interaction of concentrations detected in natural environments Brazilian state of SP have shown to be harmful to the test-organism thus affecting the aquatic ecosystem, acting as endocrine disruptors.

**WP105. Toxicity of E2 and EE2: cell damages in zebrafish male gonads and biological recover**

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This study aimed to evaluate the toxicity of 17β-estradiol (E2) and 17α-ethinylestradiol (EE2) hormones on zebrafish adult males (Danio rerio) exposed to chronic tests in laboratory using concentrations present in nature (30 ng.L⁻¹, nominal concentration). The application of two treatments (powdered activated carbon- PAC, and aquatic humic substances - AHS) to remove these hormones from water were also evaluated through biological recovery tests performed using the same organisms, and histological analyzes of male gonads were used as toxicological biomarker. Twenty six fishes were exposed to each experimental condition (control, E2 and EE2) during 21 days. At 21th test day, randomly selected organisms (n=3) were euthanized for gonads removal. The remaining fishes then followed to biological recovery tests for more 7 days with test solutions treated with PAC (0.5g.L⁻¹, n=12) or AHS (20 mg.L⁻¹, n=11) for two hours in shaker and, at 28th test day, the same number of organisms (n=3) were selected for gonads extraction. The gonads were submitted to fixation (Bouin liquid over 18 hours), washing (running water over 12 hours), dehydration (with 70% alcohol), and were included in paraffin. Serial sections (4 μm) were obtained with microtome and stained with hematoxylin-eosin (HE). Qualitative analysis was conducted through a light microscope and classified (OECD, 2010). The results were compared, before and after the period of biological recovery. Histological analysis revealed widespread cellular damage in gonadal tissue after chronic exposure to EE2, as the increased cell volume, degeneration, and sperm cell death. Furthermore, these changes were maintained irreversible after 7 days of biological recovery with both treatments. Males of control and EE2 group apparently showed no visible histological changes based on analyzes conducted as described in each assay. Histological changes observed at the cellular level in treated males research highlights the cells as the primary target of environmental contaminants remained altered despite the environmental improvement. Therefore, our results warn about the impact of female sex hormones found at low concentrations and long-term exposure to aquatic organisms, and its implications for the preservation of the species in their natural environments. More investigations to find out about the potential reversibility of such injuries and an acceptable concentration for the exposed organism should be performed.

**WP106. Developmental exposure to a glyphosate based herbicide alters uterine organogenetic differentiation causing hyperplasia on prepubertal rats.**

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Glyphosate based herbicides (GBH) are extensively used for agricultural purposes all over the word, which is closely associated with a constant increase in the use of transgenic glyphosate-resistant soybean single-cropping. Experimental studies performed in rodents have associated developmental exposure to GBH with male reproductive toxicity; however little is known regarding its effects on female reproductive system. This study investigates the effects of neonatal exposure to a GBH on uterine morphology, endometrial proliferation and expression of proteins that regulate uterine organogenetic
differentiation in rats. Female pups received saline solution (control, C) or an environmental relevant dose of commercial formulation of glyphosate (GBH, 2 mg/kg) by s.c. injection in the nape of the neck every 48 h from postnatal day (PND) 1 to PND7. The uterine expression of estrogen receptor alpha (ERα), progesterone receptor (PR), Hoxa10, Wnt7a and Ki-67 was detected by immunohistochemistry on PND8 and PND21, to evaluate acute and short-term responses, respectively. The GBH-exposed animals showed epithelial hyperplasia (75% of animals on PND8 and 37.5% of animals on PND21). In addition, a higher cell proliferation was detected in epithelial cells (C: 28.3±1.3%; GBH: 41.2±2.45%, p< 0.01, expressed as a percentage of proliferation) and stromal cells (C: 5.3±0.40; GBH: 8.5±0.80, p< 0.05, expressed as a percentage of PDNS). The deregulation of PR and Hoxa10 was detected in the uterine epithelium, stroma and myometrium of GBH-treated rats on PND8. In this group ERα was also up regulated in the stroma. The deregulation of PR and Hoxa10 persisted on PND21. Wnt7a protein was also up regulated in the stroma and glandular cells of GBH-treated rats on PND21. These results suggest that neonatal exposure to GBH induces morphological changes in uterine tissue and alters the expression of proteins involved in uterine development and differentiation. All these alterations may impact in female fertility and could promote the development of uterine neoplasias.

Leading the way to the safe and sustainable use of pesticides

WP107. A warning about Brazilian framework regarding pesticides

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Since 2008, Brazil is the world’s largest consumer of pesticides, and many authors have emphasized different problems related to that situation. In order to understand the current conjuncture, we reviewed historical, legal, economic, social, political, environmental, and public health issues related to pesticides in Brazil. The analysis indicated that the expansion of pesticide uses in Brazil began in the second half of the 20th century and all changes brought by Green Revolution occurred in a legal conjuncture that was based in a bland and obsolete regulatory model. In 1989, enactment of the Pesticide Act represented a consequence of several problems related to pesticides. Despite that law have meant an advance for a more prudent use of pesticides, it has not proven to be so effective in practice because of strong lobby from agricultural sector, prioritizing productivist agriculture to the detriment of human and environmental health. Since the beginning of the 21st century, pesticide sales in Brazil have substantially increased, both because of easing product registration and commercialization (e.g.: by tax exemptions granted by government), and because of growth of agricultural production. Many lawsuits against pesticide registers in Brazil got stuck in justice due to legal and economic power of pesticide production companies. Likewise, few active ingredients have been undergone to reassessment, but delays of legal proceedings are evident and most of them take too many years to be reassessed. There is no registration validity period for conventional registers and the validity period for emergency registers is subjective and can last long, whilst time companies take for register is short. In this scenario, several products banned in other countries are currently permitted in Brazil, and more irregularities regarding use of pesticides, like a poor supervision of authorities, are observed. Thousands of farmers have no proper care in spraying pesticides and disposing their packages. Reports from Brazilian Health Surveillance Agency show there is always a considerable number of unsatisfactory samples in food, i.e., above Maximum Residues Levels. In addition, there is virtually no monitoring of aquatic or soil systems, not even unsatisfactory samples in food, i.e., above Maximum Residues Levels. In this work, onion roots were exposed to 0, 25, 0, 5 and 1 µL/L of the insecticide Curbix® 200SC (ethiprole) using the Allium cepa assay.

WP109. Assessment of the genotoxicity, mutagenicity and citotoxicity of the insecticide Curbix® 200SC (ethiprole) insecticide using the Allium cepa assay

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The phenylpyrazole acts in antagonistic form of the inhibitory neurotransmitter GABA (gamma amino butyric acid) action preventing to occur the process of the restoring the central nervous system (CNS) after transmission of a nerve impulse. Thus, the entry of Cl- ions in the neuron is prevented and the GABA’s calming effect is inhibited. The blocking of inhibitory action caused by these insecticides results in hyperexcitability of the CNS leading to death of the animal. This group of insecticide appeared in 1950s as an alternative to chlorinated and has been used in cultivation of monocultures worldwide. Fipronil is the best known representative of this group. Several studies have been conducted and proven their generic toxicity on targets and non-target organisms. Some of the analogues of fipronil, the ethiprole, is increasingly present in the agrarian environment. This insecticide is characterized by the manufacturer as a contact and ingestion insecticide of toxicological classification III (moderately toxic). The ethiprole is marketed as a foliar and soil insecticide and for seed treatment. The ethiprole was chosen as the insecticide with smaller contact toxicity when it was evaluated with other representatives of its class. Its happens due to replacement of the trifluoromethyl-sulfanyl radical, present in fipronil, to the ethyl-sulfanyl group and its lower ipophilicity. Although, studies evaluating its effect on non-target organisms become important since the extensive use of this insecticide is becoming increasingly common. Therefore, this study aimed to evaluate the toxicity of insecticide ethiprole in Allium cepa through its commercial compost Curbix® 200SC. In this work, onion roots were exposed to 0.25, 0.5 and 1 µL/L of the product. The treatments were performed with light. The analyses were performed by the chromosomal aberrations frequency and micronucleus test. Data normality was tested by the Shapiro-Wilk test and the significance between the groups was obtained by the nonparametric Kruskal-Wallis and Dunn’s post hoc statistical significance: p < 0.05. The data were normally distributed. The insecticide was demonstrated cytotoxic and genotoxic effect when exposed to light. The results of this study confirm the ethiprole degradation exposed to light and suggests that the photoproduction resulting from such degradation may be even more toxic than the pesticide itself.
The contamination of bovine milk with pesticide residues is an extremely troubling issue, as milk is one of the most consumed foods of animal origin in the world. It is widely consumed during childhood, as it is essential for a child’s survival. Thus, the quality control of milk is of critical importance. The pyrethroid pesticides in Brazil are widely applied to livestock to combat tick (Boophilus microplus) and horn fly (Haematobia irritans) ectoparasites. Although the application of most pyrethroids in cattle is done using the pour-on method, they may cross the skin barrier, enter the blood stream and can be excreted into milk due to lipophilic properties of pyrethroids associated with the high fat content of milk. The pyrethroids are liposoluble molecules; thus, they tend to migrate to the lipid portion of the food. Therefore, it is suspected that pyrethroid residues can contaminate bovine milk of which, detection and quantification are not easy tasks, especially at low concentrations in both complex and fatty matrices.

Extraction of pesticides from fatty foods typically requires several cleanup steps in order to minimize the amount of co-extractives, and to isolate the targeted pesticides for analysis to yield more reproducible results and preserve the instrument’s integrity. Our analytical method is based on the following steps: solvent extraction using lyophilized samples and ultrasound; cleanup with a cartridge of basic alumina in tandem with a C18 cartridge; and analysis using gas chromatography (GC) and tandem mass spectrometry (MS/MS) in negative chemical ionization (NCI), which can be used to detect 17 pyrethroids (transfluthrin, allethrin, improprin, resmethrin, terameithrin, bifenthrin, fenexthrin, cyfluthrin, permethrin, cypermethrin, fenvalerate, t-fluvalinate, deltamethrin, kethodrin and flumethrin) and one organophosphorus pesticide (chlorpyrifos). Surrogate standards d10-Chlorpyrifos, d6-trans-permethrin and d6-trans-cypermethrin were employed for quantitation by isotopic dilution method. The objectives of this study were to quantify 17 pyrethroid and chlorpyrifos residues in 20 samples of bovine milk from southern Brazil, and to evaluate the presence of cypermethrin in bovine milk in cattle exposed to cypermethrin from the pour-on method. Pyrethroids were detected in all the samples at concentrations ranging from 0.47 to 270 ng g-1 lipid weight (LW). Cypermethrin was the predominant pyrethroid.

WP111. Ecotoxicity evaluation of Biobeds for pesticide disposal using Enchytraeids reproduction tests
L. Gebrler, Embrapa: L. Camargo, Soil Department; L.C. Filho, UDESC / Soil Department; J.C. Niemeyer, Universidade Federal de Santa Catarina; O. Filho, Pesticide waste disposal from washing the equipments consists in a source of contamination for agricultural soils. An alternative to this problem was founded in some countries: the discard is done in ‘beds’ filled with straw, peat and soil mixed, called Biobeds. In Brazil, this sort of effluent is not remarkable. In South of Brazil, Mancozeb and Chlorpyrifos are used in apple cultures, but their waste is discharge in soil and effects on soil organisms are unknown. An experiment with Biobeds was installed on the Experimental Station of Embrapa Vacaria in the apple harvest between 2013-2014, aiming to determine the toxicity of biobed and a natural soil – Oxisol during the harvest. The biobeds were water boxes with biomin or oxisol. The boxes received 50 Liters of effluent for each application in the crop. Samples of biomin and soils were collected on time 0 (without pesticides) and 30 days after the first pesticide application and ecotoxicity reproduction tests were conducted with Enchytraeus crypticus (Enchytraeids) following ISO 16387:2014. The number of juveniles for each treatment (Biomin or Oxisol) was compared for every times, with t-test. The last sample in biomin (420 days after the first application) not differed from the control (p>0.05), showing a reduction of toxicity in the course of time. However, in Oxisol, the toxicity remained over time. Furthermore, reproduction of E. crypticus was lowest in Oxisol than in biomin over the sampling time, which indicate higher pesticide toxicity for E. crypticus in Oxisol. The study indicates that biobeds can be used for reduce the washing and handling pesticide contamination foragricultural areas in Brazil.

WP112. Ecotoxicity of Chlorpyrifos to Folsonia candida (COLLEMBOLA) and Ensenia andrei (OLIGOCHAETA) in two different Brazilian soils.
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Apples orchard have high representativeness in Brazilian south and for this cultivation, several pesticides are used, specially the insecticide Chlorpyrifos. This product is forbidden in some countries, whereas used in many crops in other ones. For pesticide registration in Brazil, earthworms lethality test is the only representative of soil fauna. The aim of this study was measure the toxicity of Chlorpyrifos to collemobol (Folsonia candida) and earthworms (Ensenia andrei) using standardized ecotoxicity tests following the ISO 11267 (2014), ISO 11268-1 and ISO 11268-2 (2012), respectively, in two representative soils for apple cultivation in the South – Oxisols (Latosolos and Nitossolos). The results showed high toxicity for collemobol in both soils in lethality tests (LC50<1 mg kg-1) and for reproduction tests (EC50s 0.005 mg kg-1). The toxicity in latosolo and nitossolos did not differ statistically for the reproduction of earthworms (EC50s 0.005 mg kg-1 and 0.006 mg kg-1) after the first pesticide application and did not showed high toxicity in lethal tests (LC50s 64.09 mg kg-1 and LC50s 204.63 mg kg-1 respectively). Although the Brazil’s law indicate only lethality test with earthworms to the pesticides registration, this study showed high toxicity of Chlorpyrifos to collemobol – representative of soil mesofauna in studies with pesticides in Europe. The results also evidenced the importance of sublethal tests in the evaluation of pesticides toxicity.

WP113. Evaluation of endotoxic Bacillus thuringiensis var. israelensis and pyrethroid cypermethrin in Chironomus calligraphus (Diptera: Chironomidae)
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Pesticides are extensively used for the control of agricultural pests and disease vectors but they also affect both humans and animals. Cypermethrin (CYP) is a pyrethroid widely used in the Pampean region. Bioaccumulation of heavy metals and pesticides in earthworms selected, which is highly sensitive to heavy metals and pesticide, is discharge in soil and effects on soil organisms are unknown. An experiment was designed with Enchytraeus crypticus (Collembola) of Pampean region. Third instar larvae were exposed to serial dilutions of CYP (0.0025-6.4 µg/L) and Bti (0.5-16 µg/L) to determine 96-h LC50 values. A control group without insecticide was included. After the 96 h assays, the entire larvae were fixed in Bouin solution and 4% formaldehyde, then dehydrated and embedded in plastic resin. Sections 3 µm were stained with hematoxyline-eosine and observed under optical microscope. For the ultrastructural studies the larvae were fixed in 2.5% glutaraldehyde and ultrathan section were observed under electron microscope. The 96-h LC50 values were 1.560 µg/L and 0.045 µg/L for CYP and Bti respectively. And no histological changes were observed in the midsection of the digestive tract. The midgut of the control group showed a single layer of cubical cells with microvilli in the apical surface and a big central nucleus. At very low concentration of Bti (2 µg/L) no histological changes were observed, but at 4 ng/ml exposure some minor histopathological changes were observed in the midgut as disturbance of the microvilli. At Bti exposures of 7.5 µg/L, the midgut cells lost the contact with their basal membrane and started to be disorganized, while at 15 µg/L the epithelium is completely disorganized. Chironomus calligraphus was sensitive to Bti and CYP toxicity as other Chironomus species. This would be interesting to carry out studies in larvae collected from freshwater bodies with insects to confirm the relationship between the stress situations and the histopathological changes observed in this study.

WP114. Experimental factorial design for determination of organochlorine pesticides collected in passive samplers with polyurethane foam
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The organic persistent pollutants can be collected through different types of samples, among them are the passive samplers. They do not need electrical energy and are based in the free flux of the analytes to the sorbent surface. This is made of polyurethane foam (PUF) where the compounds are deposited. In this study, we focused on organochlorine pesticides (OPs) collected during a long exposure time (90 days). The aim of this study is to show the results from an optimized methodology to determine OPs from PUF. The conventional methodology is by Sordilet (TO-10A Method, EPA). We extracted PUF spiked
with 40 ng of 17 OPs using a technology based on ultrasonic extraction. The sample is located in a cell with reflux, which is immerse in an ultrasound bath and filtered on line to avoid loss by manipulation (Amador-Muñoz et al., 2012; Número de expediente Mx/a/2012/000790). The extraction optimization was based in an experimental factorial model 23. It was used 50 mL of dichloromethane, twice. The variables evaluated were: power (40 % and 80 %), time (20 and 40 min) and temperature of water bath (50 °C and 70 °C). The best results were 40 %, 40 min and 50 °C, respectively. The recoveries were between 45.4 % (DDDE) and 89.2 % (d-HCH), except for endrin aldehyde (10 %). The instrumental detection limits ranged between 0.5 (endosulfán sulfato) and 22.3 pg/mL (4,4'-DDE), while the limits of quantification ranged between 0.9 and 21.6 pg/mL. Method linearity was the lowest for 6-HCH (0.927) and the highest the 4,4'-DDT (0.999). Preliminary study of some samples in rainy season in three points of Mexico showed that almost all the compound were below of detection limits, except for Alzotrom (4200 m.a.s.l) where 7.9 pg/mL of endosulfán I was found. Nowadays 48 samples of 5 sites in Mexico have been collected through 2014 – 2015 period, and will be analyzed in the next period. We expected to continue the sampling one year more and to make some correlations between the concentrations and the characteristics of the place where they were found (height, type of soil and type of pesticide). We will expect to make some approximations to spatial and seasonal distribution of OPs in specific areas of Mexico. GEAL acknowledges to CONACyT for PhD scholarship Research. This study is financial supported by projects: PAPIIT No. IN16614 and CONACyT 191135 bilateral Mexico-Argentina.

WP115. Generación de escenarios pampeanos para estimar concentraciones de plaguicidas en cuerpos de agua: un primer paso hacia la evaluación de riesgo

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En varios países el registro de nuevos plaguicidas contempla el uso de programas de modelado como parte de la caracterización de la exposición para la evaluación de riesgo. El software “Surface Water Concentration Calculator” (SWCC) requiere datos de suelo, clima y fenología de los cultivos para definir un escenario sobre el cual modelar las concentraciones de plaguicidas que llegarían a un cuerpo de agua superficial luego de una aplicación. El objetivo del presente trabajo, fue evaluar la influencia del tipo de suelo, régimen de lluvias y grupo hidrológico del suelo (GH) sobre la concentración de plaguicida modelada por SWCC, de manera de identificar los parámetros más críticos para el modelado. Se ingresaron datos diarios de evaporación de tanque A, precipitación, radiación, temperatura y velocidad del viento a 10m obtenidos de la estación meteorológica Olivos, Santa Fe, para un período seco (1974-76) y lluvioso (1978-80). Se simularon aplicaciones de 1kg/h para 3 series de suelos Argíolicos Típicos (AT) y 3 series de Hapludoles Típicos (HT) para 4 plaguicidas P1, P2, P3, P4 con diferentes grados de persistencia y movilidad, siendo para P1: DT50 3 días + KOC de 10 mL/g; P2: DT50 3 días + KOC de 1000 mL/g; P3: DT30 300 días + KOC de 100 mL/g y P4: DT30 300 días + KOC de 1000 mL/g. Las concentraciones máximas (en µg/L) fueron en promedio para los suelos AT de 14.7±4.0, 2.5±0.1, 151.1±6.8 y 83.9±4.4 para los plaguicidas P1, P2, P3 y P4 respectivamente, mientras que las concentraciones fueron de 15.3±0.2, 2.4±0.2, 145.1±4.5 y 81.2±1 para P1, P2, P3 y P4. Con respecto a la influencia del GH del suelo y de la cantidad de lluvia, el efecto de estos parámetros fue mayor para P3 en ambos casos; variando el GH del suelo de la categoría A a D la concentración en agua pasó de 22.3 a 154.5 µg/L, mientras que la concentración varió de 94 a 154.5 µg/L entre un año seco y lluvioso. El GH y las lluvias influyeron más en la llegada del plaguicida al agua superficial que otros parámetros, en especial para plaguicidas de alta movilidad y persistencia como P3, debiéndose tener en cuenta al momento decidir cuántos escenarios generar en la región.

WP116. Mixture of pesticides and their effects on non-target organisms

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Born Repouso is a small city located in a mountainous region of Minas Gerais (Brazil), and the agriculture production (potato and strawberry) is the main economic source, where the use of pesticide (insecticide/acaricide Avermectina and the fungicides Estrobilurina and Triazol), isolate or combined, is current to ensure a high level of protection and competitiveness of agriculture. This is why producers need to demonstrate their PPPs do not have any harmful effect on human or animal health, including that of vulnerable groups, or any unacceptable effects on the environment. In South America, the legal base of the matter is not guided in detail to the extent it is in the US or Europe, and therefore it is often not clear how to investigate the potential impact of a certain PPP. For the evaluation of risks of PPP applications to non-target organisms, e.g. bees, birds and mammals several guidelines are available in the US (bees: USEPA/PMRA/CDPR 2014) and Europe (bees: EFSA 2014; birds and mammals: EFSA 2009) and several testing methods are available. The current poster presents a number of these higher tier methods applied in the US and Europe, applicable in South America and their main endpoints.

WP117. Modelación de la dispersión de atraza y 2,4-D en el cuenca del embalse los molinos (Córdoba)

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La implementación de los Modelos de Dispersión de Pesticidas como el SOILFUG permite la evaluación de la distribución y la concentración de los pesticidas en los diversos compartimentos ambientales. El embalse Los Molinos es un cuerpo de agua de usos múltiples que se encuentra localizado en una cuenca agrícola donde predominan cultivos anuales de soja, maíz y trigo. El objetivo del presente trabajo fue estimar las concentraciones de Atraza y de 2,4-D en agua de escorrentía que podrían ser movilizadas en la cuenca del embalse Los Molinos a partir de datos de aplicación en campo de ambos herbicidas. Se utilizaron las Fichas Fitosanitarias para conocer las dosis de aplicación de los herbicidas en la cuenca, las áreas cultivadas y tipo de cultivo, así como también las fechas estimadas de aplicación. Se simularon dos escenarios de dispersión de Atraza y 2,4-D: 1) un predio particular de 100 ha y 2) la totalidad de los campos sembrados (5000 ha). Se consideró como rango de aplicación las dosis declaradas en las Fichas para Atraza 0.54 a 1.5 Kg/ha y para el 2,4-D 0.3 a 0.74 Kg/ha. Asimismo, se determinó por HPLC la presencia de ambos herbicidas en muestras de agua superficial extraídas de los tributarios del embalse Los Molinos. Como resultado de la modelación se determinó que, dependiendo de los escenarios considerados las concentraciones podrían variar 2.3 a 18 µg/L de Atraza, mientras que para el 2,4-D en agua de escorrentía debería hallarse entre 0.5 a 26 µg/L. Se detectó la presencia de Atraza en muestras de agua del río Los Reartes, tributario del embalse Los Molinos que atraviesa la zona donde se concentra la actividad agrícola, en concentraciones de 8 y 12 µg/L en coincidencia con los valores obtenidos producto de la modelación.

WP118. Non-target organisms - higher-tier methods to refine the risk of plant protection products

J. Lueckmann, J. Ludwigs, M. Delgado, Rifcon GmbH

The significance of ecologically compliant plant protection products (PPP) is getting more and more attention worldwide and coming into focus of the public and political perception as their use may involve risks and hazards for humans, animals and the environment. As a result, regulations have been developed to ensure a high level of protection to both human and animal health and the environment, while at the same time maintaining safeguards for the competitiveness of agriculture. This is why producers need to demonstrate their PPPs do not have any harmful effect on human or animal health, including that of vulnerable groups, or any unacceptable effects on the environment. In South America, the legal base of the matter is not guided in detail to the extent it is in the US or Europe, and therefore it is often not clear how to investigate the potential impact of a certain PPP. For the evaluation of risks of PPP applications to non-target organisms, e.g. bees, birds and mammals several guidelines are available in the US (bees: USEPA/PMRA/CDPR 2014) and Europe (bees: EFSA 2014; birds and mammals: EFSA 2009) and several testing methods are available. The current poster presents a number of these higher tier methods applied in the US and Europe, applicable in South America and their main endpoints.

WP119. O agrotóxico noxio de cada dia

E. Pereira, UFPA / Laboratório de Ecologia
Os agrotóxicos são amplamente utilizados no meio rural e sua larga utilização desprovida de medidas de biossegurança apropriadas vem provocando impactos potenciais, tanto para o ambiente quanto para a saúde humana. A partir da Segunda Guerra Mundial, a utilização dos agrotóxicos se intensificou e, associada a grande demanda por alimentos, tornou-se indispensável na agricultura. No entanto, muitas dessas substâncias químicas são consideradas tóxicas, o que torna testas in vitro e in vivo necessárias.

El imidaclorpid es un insecticida neonicotinoido sistémico utilizado concurasémia en los cultivos de granos. En los últimos años, su uso ha sido associado a la presencia de efectos perjudiciales sobre especies no blanco, en particular sobre los polinizadores. Por otro lado, preocupa la posibilidad de efectos en las aves granívoras, que ya las semillas tratadas pueden quedar disponibles como alimento para las mismas. Con el objetivo de conocer el efecto del imidaclorpid sobre las aves silvestres, se realizó un estudio de toxicidad aguda en el que se calculó la dosis letal 50 (DL 50). Se trabajó con individuos adultos de tordo mudo (Agelaioides biduus), un ave granívora típica de los agroecosistemas de la Región Pampeana, que por sus hábitos alimenticios podría verse expuesta. Se siguió el protocolo recomendado por la Organización para la Cooperación y el Desarrollo Económico (OECD Test Guideline 223). Se testearon concentraciones entre 8,48 y 424 mg/kg de peso corporal (pc) administradas en una única dosis por sonda gástrica. Las dosis a administrar fueron preparadas a partir de una solución madre de 25 mg/mL del formulado comercial Confidor 35sc (Bayer). La concentración de las soluciones madres fueron comprobadas mediante cromatografía líquida y espectrometría de masa (LC-MS/MS). La varianza de las soluciones madres fue de 20,7 ± 4,5 mg/kg, correspondiendo a un 82,6% del valor nominal. A partir de los 15 minutos se pudieron observar los signos de intoxicación, tales como: pérdida de equilibrio y coordinación, pérdida de tonicidad muscular, temblores, inmovilidad. La muerte ocurrió dentro de las 24 horas, y la recuperación total de los individuos que sobrevivieron dentro de las 48 horas. La DL50 obtenida fue de 57,11 mg/kg pc con un intervalo de confianza de 45,5 a 68,78 mg/kg pc. Este valor de DL50 coloca al imidaclorpid en el límite de la categoría altamente tóxico, cuando en manífesteres está calificado como moderadamente tóxico.

**WP120. Persistence of cyfluthrin in indoor dust**

S. Papini, Secretaría municipal de Salud de São Paulo / Supervisión Técnica de Salud JabaquaraVila Mariana; L.E. Nakagawa, A. Costa, R. Polatto, C. Nascimento, Instituto Biológico / Laboratório de Toxicología

Pesticides are often applied in homes and buildings to control pests like cockroaches, fleas, flies, mosquitoes and termites. In contrast to outdoor environment pesticides used in indoor environment, tend to be more persistent, since physical, chemical and biological conditions, which favor the degradation, are not always present. This way, organisms that could be directly affected by this application would be the man and his domestic animals. For greater security is important to know the persistence of these products when applied indoor environment. Pesticide residues on house dust that accumulate in carpets and on other residential indoor surfaces may present a chronic exposure risk. In Brazil, there is little information of persistence on the environmental indoor and the possible risks to human health. Therefore, pyrethroids are frequently used indoor environment, including cyfluthrin that has widespread use; this work is proposed to investigate the persistence of cyfluthrin in house dust. For this, the concentration of cyfluthrin was monitored in house dust samples for 56 days in laboratory conditions. Cyfluthrin was applied in dust samples and soon after application and after 14, 28 and 56 days was quantified by high performance liquid chromatography. The results between the initial applied and the values observed after 14, 28 and 56 days were analyzed by t Test with significance level of 0.05. It was not observed significant changes in the concentration of cyfluthrin in house dust samples even after 56 days compared to the initially applied. The results show that the persistence of cyfluthrin in house dust. This may indicate a possible exposure of the people that are in this place, especially young children and elderly. Support FAPESP nº 2013/17822-3

**WP121. Pesticides: a comparative analysis of legislation between Brazil, European Union and United States of America**

A. Rocha; E. Espindola, University / Hydraulics and Sanitation

The aim of this study was to analyse the current and historical processes related to the pesticides legislation in Brazil in comparison with European Union and United States of America by literature reviewing and by addressing legal, social and environmental risks associated with pesticides. The particularities that countries present in legal framework and in functioning of public administration were analysed. In Brazil, the Pesticide Act increased the rigor of regulation in relation of pesticides, but no proportional improvements in practice has been observed, especially after some legal changes at the 21st century. Some other aspects aggravate the situation, as the limited supervision of sale and use of pesticides, as well as tax incentives to the trade of products. In European Union, each Member State has its own pesticide regulations, but there are regulations at bloc level. Therefore, its legislation has been renovated on more up-to-date principles regarding environmental issues that resulted in the Thematic Strategy on the Sustainable Use of Pesticides and in the enactment of Directive 2009/128/EC. The United States has an older and more complete legal framework on the Sustainable Use of Pesticides and in the enactment of Directive 2009/128/EC. The particularities that the European Union and United States of America by literature reviewing and by addressing legal, social and environmental risks associated with pesticides, the country has recently undergone almost all the active ingredients to pesticide tolerance reassessment and (re)registration, which resulted in cancellation of many substances. There are evidences that this process has improved the quality of water in relation to the amount of pesticides, for example. The international comparison appeared interesting since it showed differences between countries under dissimilar stages of development. The

**WP122. Toxicity study of the insecticide imidacloripid in the house dust (Agelaioides bidus).**

M.B. Poliseri, INTA / Biodiversidad Ecológica y gestión ambiental; D. Cristo, M. Zaccagnini, INTA; J. Brodeur, CONICET

El imidacloripid es un insecticida neonicotinoido sistémico utilizado concurasémia en los cultivos de granos. En los últimos años, su uso ha sido asociado a la presencia de efectos perjudiciales sobre especies no blanco, en particular sobre los polinizadores. Por otro lado, preocupa la posibilidad de efectos en las aves granívoras, que ya las semillas tratadas pueden quedar disponibles como alimento para las mismas. Con el objetivo de conocer el efecto del imidacloripid sobre las aves silvestres, se realizó un estudio de toxicidad aguda en el que se calculó la dosis letal 50 (DL 50). Se trabajó con individuos adultos de tordo mudo (Agelaioides bidus), un ave granívora típica de los agroecosistemas de la Región Pampeana, que por sus hábitos alimenticios podría verse expuesta. Se siguió el protocolo recomendado por la Organización para la Cooperación y el Desarrollo Económico (OECD Test Guideline 223). Se testearon concentraciones entre 8,48 y 424 mg/kg de peso corporal (pc) administradas en una única dosis por sonda gástrica. Las dosis a administrar fueron preparadas a partir de una solución madre de 25 mg/mL del formulado comercial Confidor 35sc (Bayer). La concentración de las soluciones madres fueron comprobadas mediante cromatografía líquida y espectrometría de masa (LC-MS/MS). La varianza de las soluciones madres fue de 20,7 ± 4,5 mg/kg, correspondiendo a un 82,6% del valor nominal. A partir de los 15 minutos se pudieron observar los signos de intoxicación, tales como: pérdida de equilibrio y coordinación, pérdida de tonicidad muscular, temblores, inmovilidad. La muerte ocurrió dentro de las 24 horas, y la recuperación total de los individuos que sobrevivieron dentro de las 48 horas. La DL50 obtenida fue de 57,11 mg/kg pc con un intervalo de confianza de 45,5 a 68,78 mg/kg pc. Este valor de DL50 coloca al imidacloripid en el límite de la categoría altamente tóxico, cuando en manífaseres está calificado como moderadamente tóxico.

**WP123. Utilizaeni**

A. Clavijo, Instituto de Investigaciones en Biotecnología; INBA CONICET; Facultad de Agronomía, Universidad de Buenos Aires; M.F. Kronberg, INBA CONICET, Facultad de Agronomía, Universidad de Buenos Aires

En la monitorización de la contaminación de aguas, es cada vez más frecuente que los estudios toxicológicos incluyan bioensayos con organismos indicadores capaces de revelar la presencia de contaminantes y la interacción entre ellos, proporcionando de esta manera alertas tempranas de potenciales riesgos ambientales. Los métodos analíticos normalmente utilizados son sensibles y confiables, pero requieren un set patrones de referencia conocidos, limitando su espectro de detección. Debido a que las muestras ambientales pueden contener tóxicos indefinidos, las agencias de protección ambiental recomendían incluir un indicador animal para complementar el análisis de las muestras. Uno de los organismos modelo ideales para este tipo de ensayos es el nematodo Caenorhabditis elegans. La mayoría de sus procesos fisiológicos básicos se encuentran conservados en organismos superiores. Además, su ciclo de vida corto, su fácil y bajo costo de mantenimiento y la secuenciación completa de su genoma, permiten el desarrollo de pruebas toxicológicas rápidas y económicas que permiten analizar gran cantidad de compuestos y definir sus mecanismos de acción molecular. El objetivo de este trabajo es validar el uso del nematodo C. elegans como modelo biológico y herramienta toxicológica integral para la detección de contaminantes en aguas. Para ello recoleccionaron muestras de agua de la región pampeana coincidente con la campaña 2013/2014 de soja. Con dichas muestras se realizaron los análisis fisicoquímicos, la determinación de glifosato y los bioensayos con el nematodo C. elegans. En el caso del bioensayo con las muestras de agua, se utilizó el protocolo establecido en la normativa de referencia ISO 10872:2010 que utiliza el crecimiento como parámetro a evaluar en estudios eco-toxicológicos. Con el fin de establecer un protocolo de trabajo, los resultados se compararon con los obtenidos previamente con glifosato como tóxico de referencia, y se determinó la relación dosis-respuesta mediante la valoración del crecimiento corporal. Si bien no se detectó glifosato en las muestras analizadas, los bioensayos muestran que existe toxicidad. A partir de los análisis físicos
químicos, se aprecia que el crecimiento se correlaciona inversamente con aguas de baja calidad.

Thursday
Fate and Effects of Nanomaterials

RP001. A scientometric study of nanotoxicology: where we are and where we must go

L.A. Geracitano, INCT Nanocahone; S. Fagan, Centro Universitário Francisco ces (UNIFRA); J. Monserrat, Universidade Federal do Rio Grande - FURG / Instituto de Ciências Biológicas ICB

At present is observed an exponential growth of nanotechnologies and the use of diverse nanomaterials. This context has prompted the development of Nanotoxicology, an area of scientific knowledge aimed to evaluate potential deleterious effects of these new materials in organisms and in the environment. Our goal was to determine the state of art of Nanotoxicology in the actual scientific scenario. Thus, a database was generated employing Web of ScienceTM Core Collection with the search in topic: “Nano* & Toxicity”. For trends and patterns detection of Nanotoxicology publications it was used the free software CiteSpace III. Parameters analyzed were: (1) Web of Science Categories, (2) Cited Reference, (3) Cited Author, (4) Cited Journal, (5) Keyword, and (6) Country. Using CiteSpace it was established burst (a node attribute that has a lot of citations within a certain time) and centrality (a measure associated with the potential influence of a scientific contribution to generate a new paradigm). The Web of Science topic search for “Nano* & Toxicity” returned 15,462 records published between 1982 and 2014. The most important category of Web of Science was CHEMISTRY with 4870 articles. The high burst in this analysis was PHARMACOLOGY & PHARMACY. The high centrality was shown by TOXICOLOGY. The more cited references were Neal A (2006, Science, V311, P622), Oberdorster G (2005, Environ Health Persp, V113, P823) and Lam CW (2004, Toxicol Sci, V77, P126) with 1,447, 1,215 and 703 citations respectively. Cited references with items containing high burst were References Warheit DB (2004, Toxicol Sci, V77, P117); Lam CW (2004, Toxicol Sci, V77, P126) and Oberdorster E (2004, Environ Health Persp, V112, P21). The more important Cited Journals were BIOMATERIALS in number, NANOSCALE in burst, ANAL BIOCHEM in centrality. Keywords more used were TOXICITY and NANOPARTICLES in number, PULMONARY TOXICITY in burst, TOXICITY in centrality. USA, PEOPLE R CHINA and INDIA were the countries with the highest number the articles. An analysis of results showed predominance of in vitro research in Nanotoxicology and a low frequency of environmental studies. The obtained results clearly point to the need of environmental nanotoxicology and nanocotoxicology development under a context of needs of regulations for the safe use of nanomaterials.

RP002. Are manufactured nanomaterials toxic to soil fauna and microbial communities?


Manufactured nanomaterials (NMs) are a relatively new class of compounds characterised by a considerable high surface/volume ratio and with particular physical, chemical, electrical, optical, mechanical and magnetic properties, with promising beneficial developments in different areas (e.g. pharmaceuticals and cosmetics). However, NMs may cause disruption of cell membranes, or of membrane potential, protein oxidation, and may interfere with energy transduction, may cause genotoxicity and promote the formation of reactive oxygen species. The increasing use of NMs is contributing to increase its concentrations in the environment. For this reason, USEPA and EU ECHA recommend the evaluation of the risks of new emerging NMs to humans and the environment. In spite of that, the toxicity of most of the commercialized NMs is unknown. Aiming to fill this lack of knowledge, the toxicity of three NMs to soil fauna and soil microbial communities was evaluated. The effects of nano-veicles of sodium dodecyl sulphate/didodecyl dimethylammonium bromide (SDS/DDAB), of titanium silicon oxide (TiSO4) and of cobalt oxide (CoSO4) were investigated through avoidance tests with the earthworm Eisenia andrei and the cobellomman Folsomia candida, reproduction tests with E. andrei, F. candida, the potworm Enchytraeus crypticus and the mite Hypoaspis aculeifer. These laboratory tests were performed using soils with increasing concentrations of the three NMs and following standard procedures. Additionally, basal respiration and microbial biomass were measured in gradients of laboratory spiked soils to evaluate the effect of the NMs on microbial communities. Results for soil fauna showed that enchytraeids and mites reproduction was not significantly affected by the NMs tested in any concentration. Earthworms avoidance behaviour was more sensitive than the one of collembolans. On the other hand, earthworm reproduction was not affected by NMs, contrarily to that of collembolans that was significantly affected by SDS/DDAB and Co3O4. The Co3O4 was the most toxic NM followed by SDS/DDAB and TiSiO4. In general, soil basal respiration was improved in the lowest concentrations and the microbial biomass was not significantly affected by the NMs. The results obtained showed that the NMs tested may be toxic for both soil fauna and microbial communities (although in different manners) and that particular attention should be given to the release of these type of compounds in the environment.

RP003. Ecotoxicity of TiO2 nanoparticles on Prochilodus lineatus: genotoxicity, neurotoxicity and hematological effects after acute and chronic exposure.

F. Mendes, Universidade Federal de Sao Carlos / Ciencias Fisiologicas; T.L. Carmo, Universidade Federal de Sao Carlos / Ciencias Fisiologicas; E. Pesenti, M.M. Cestari, Universidade Federal do Paraná / Genetica; C.B. Martinez, Universidade Estadual de Londrina / Ciencias Fisiologicas; E.S. Costa, J.B. Fernandes, Universidade Federal de Sao Carlos / Quimica

Titanio dioxide nanoparticles (TiO2 NP) has been applied in many industrial products however, its dispersion in the water bodies and its effects on the aquatic fauna are not completely established. This study determine the lethal concentration (LC50, 48h) of TiO2 NP and evaluated the genotoxicity, neurotoxicity and the hematological effects on the Neotropical fish, Prochilodus lineatus after acute (48 h) and chronic (14 d) exposure. Fish were exposed to 0 (control group), 0.5; 1.5; 3.0 e 15.0 mg L-1 TiO2 NP during 48 h e 14 days and after that samples of blood, muscles and brain were collected for analyses. The TiO2 NP CL50; 48h for P. lineatus was higher than 250 mg L-1. After chronic exposure, the TiO2 NP accumulation in the muscles was higher than in the brain and the acetylcholinesterase inhibition occurred only in the white muscles. The TiO2 NP did not cause genotoxicity in the erythrocytes after acute and chronic exposure. No change the hematological variables was observed after acute exposure but, after chronic exposure, the erythrocyte number decreased, the mean corpuscular volume and mean corpuscular hemoglobin increased. The total number of leukocytes decreased and the monocytes percentage increased after acute exposure and the total number of leukocytes remained low and the lymphocytes percentage decreased after chronic exposure. These results suggested that TiO2 NP cause neurotoxicity in white muscles, hematological disturbance and immunological depression. Financial support: FAPESP Proc. 2011/10339-0, 2014/05701-0, CNpq/INCT-TA Proc. 753949/2008-5, CNpq Proc. 304279/2011-0.

RP004. Ecotoxicological effects of nanostructured activated carbon on fish Geophagus brasiliensis: impacts on oxygen consumption and ammonia excretion.

A. Zingotto, Instituto de Pesca; D.S. Teodoro-Martínez, INSTITUTE OF CHEMISTRY UNICAMP / Laboratory of Solid State Chemistry; E. Barbieri, Instituto de Pesca

Nanostructured activated carbon (NAC) is a new type of carbon-silicic material produced from sugarcane bagasse residue, with potential applications for environmental remediation of pollutants (e.g. dyes, heavy metals, pesticides and microbial toxins). In this work, we evaluated the ecotoxicological effects of NAC on the freshwater fish Geophagus brasiliensis. NAC was not toxic to G. brasiliensis at concentrations ranging from 1.0 to 10 mg L-1 for exposure times up to 96 h. The oxygen consumption and ammonia excretion were measured to evaluate the impacts of NAC on fish metabolism. First, the fishes (n=5) were maintained on respirometer for 60 min, to reduce stress handling. After this time, the water supply was suspended and respirometers were closed. After 60 min, the oxygen and ammonia were measured by Winkler and phenolhypochlorite methods, respectively. It was not observed effects on oxygen consumption and ammonia excretion after 24, 48 and 72 h exposure time to NAC (from 1.0 to 10 mg L-1). However, it was observed an increase on oxygen consumption and ammonia excretion after 96h exposure. Finally, these findings show for the first time that NAC produced from sugarcane bagasse residue acts by disrupting the metabolism of G. brasiliensis. By considering the massive industrial
production of nanostructured materials from biomass, this work draws attention for the potential interactions of these materials with classical pollutants in the aquatic environment and their ecotoxicological implications.

**RP005. Effect of mesoporous silica nanoparticles on SAOS viability and mesenchymal cells differentiation**

G. Alvarez, I. Alvarez Echazú, C. Olivetti, IQUIMEFA-CONICET; M. Desimone, Facultad de Farmacia y Bioquímica Universidad de Buenos Aires

The effect of various mesoporous silica nanoparticle concentrations on SAOS viability was determined in vitro. These nanoparticles significantly increased cell proliferation after 48 h compared to a control in concentrations between 0.06 and 0.6 mg ml⁻¹. However, nanoparticles in concentrations above 1.2 mg ml⁻¹ appeared to be toxic for cells with a 40% decrease in their viability for 2.4 mg ml⁻¹. These results are in agreement with previous works where rat primary culture osteoblasts in contact with the ionic products from the dissolution of a bioactive glass with 60% of silica, increased their viability when compared to control cultures. Alkaline phosphatase activity was measured after incubating mesenchymal cells with MNPs. Interestingly, MNPs also had a differentiation effect over cells as ALP activity significantly increased.

**RP006. Effect of silica nanoparticles (SiO2NPs) on Monocytes/Macrophages cells**

M. Saraceno, Laboratorio de Inmunología INEDES Departamento de Ciencias Básicas UNLa / INEDES Departamento de Ciencias Básicas; R. Mitrovic, Universidad Nacional de La Juan / Ciencias básicas; M. Todone, Cátedra de Inmunología IDEHU-CONICET FFyB UBA / Cátedra de Inmunología IDEHU/CONICET; M. Fernández, E. Malchiodi, Cátedra de Inmunología IDEHU-CONICET FFyB UBA; M. Desimone, IQUIMEFA-CONICET Facultad de Farmacia y Bioquímica UBA / IQUIMEFA-CONICET; M. De Marzi, Laboratorio de Inmunología INEDES Departamento de Ciencias Básicas UNLa / Ciencias básicas

The employment of nanoparticles (NPs) as drug delivery has gained attraction in recent years for their use with therapeutic purposes. NPs can also be used as a carrier for the therapeutic or immunomodulating molecule. In addition, NPs can transport antigens to generate a specific immune response. Recently, silica NPs (SiO2NPs) have proved to be a suitable and biocompatible tool for the immobilization of biomolecules, microorganisms, and for the entrapment of mammal’s cells. In this work we obtained SiO2NPs of different size (10-500 nm, as determined by Dynamic Light Scattering) and charge (positives and negatives, as zeta potential characterization) by the Stöber method or using inverse microemulsions and surface modification. We analyzed the effect of the different NPs on monocytes/macrophages cultures (THP-1) at different times (24-168 h), cells densities (0.1-1 x 10⁶ cells/ml) and NPs concentrations (10-100 nM).

Proliferation of cells were determined by MTT assay observing that different positive NPs did not affected cell proliferation while negative NPs ≥ 380 nm decreased between 50-70% THP-1 cells proliferation at 24 h of culture, and negative NPs between 100-380 nm need at least 48 h of culture to reduce cell proliferation 32-83 % respect to controls. At 168 h of culture all negative NPs reduce proliferation ~30-40%. On the other way, cell activation was evaluated. Negative NPs ≥100 nm increased nitrite secretion by 24 h of culture (8-16 times). In the same way negative NPs ≥ 100 nm increase IL8 and IL12 secretion by 48 h (2-10 times respect controls). Positive NPs and 10 nm negative NPs don’t induce ILs or nitrite secretion. All negative NPs increased membrane expression of CD86, CD80 and CD14 (~2-8 times) while positive ones increased CD86 and CD14 expression (2-10 times). Negative NPs decreased CD11 expression (~50%). Finally, negative NPs increase monocye/macrophage membrane damage after 48 h of culture as determined by 7AAD cell incorporation (1.5-4 times). We detect a low percentage of cells in apoptosis process. In conclusion, negative silica NPs ≥ 100 nm have cell activation properties, and could be useful for immune stimulation, while negative NPs of 10 nm and positive NPs have low impact on immune system cells and would be useful for molecule transportation since they are unable to stimulate antigen presenting cells.

**Silver nanoparticles (AgNPs) are present in a multitude of consumer and medical stuff due to their antimicrobial properties. The increase in production and consumption of silver-containing products leads to the release of AgNPs into the environment, therefore safety concerns have raised. The aim of the study was to analyze oxidative stress responses and metabolic parameters in different tissues of juvenile Prochilodus lineatus exposed to AgNPs. Fish were exposed to the following AgNPs concentrations: (Colloidal nanosilver, Nanotek S.A.): 25 µg L⁻¹: 2.5 µg L⁻¹ (0.5 and 0.05 of 96-h LC50 value approximately) and 0 µg L⁻¹ (control) (2 fish per aquarium, with 5 replicates per treatment). The aquarium solutions were renewed every 48 hours. After 5 and 15 days, liver, intestine, gills, brain and muscle samples were obtained from exposed and control fish. Oxidative stress biomarkers were evaluated in all organs through activities of antioxidant enzymes (catalase, glutathione S-transferase, glutathione reductase and glutathione peroxidase) and lipid peroxidation levels (LPO). Glycogen, protein and lipid content were determined in liver and muscle. In the liver of fish exposed to 25 µg L⁻¹ of AgNPs for 15 days, an induction of all antioxidant enzymes activities was observed in comparison with the control. It was accompanied by an increase in LPO levels which duplicated the control values. In regard to gills, all enzymes activities decreased after 5 days of exposure at the lowest concentration of AgNPs with respect to the control. On the contrary, the LPO levels decreased after 5 days at both concentrations. The enzyme activities measured in intestine and brain showed no differences among the treatments. However, LPO levels in muscle increased at both AgNPs concentrations. Regarding the metabolic responses, glycogen content showed a significant increase in liver and muscle of fish exposed to 25 µg L⁻¹ of AgNPs for 15 days, while protein concentration decreased only in muscle. The results confirmed that the presence of AgNPs, in short and subchronic exposures, cause oxidative stress mainly in the liver of fish. Furthermore, energy reserves were altered under the highest concentration and time of exposure. Thus it could threaten the health of fish and generate vulnerability in cases of environmental stress conditions.**

**RP008. In vivo genotoxicity assessment of titanium dioxide nanoparticles (Ntio2) and lead (PbH) in Hoplias lineatus (Erythrinidae) after water exposure.**

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One of the main types of anthropogenic alteration of water quality is the release of pollutants loads. Over the past two centuries, the production was based in the industrialization process, and as a result of population growth and the technological and agricultural advancements the need of synthesis of new compounds emerged. Nanomaterials produced on a large scale have unique physicochemical properties that contribute for its widespread use in various sectors of production. Nanoparticles of titanium dioxide (Ntio2) have been widely used in cosmetics, sun-filters, fuel additives, catalysts, dies, food colours and in various other industrial applications. Lead is a metal found in the environment and widely used by society, but is a non-essential metal. Despite the controlled use, lead is still used in industries, in the manufacture of batteries, paint, refinishing, in auto repair, welding, piping clean water and the composition of tobacco smoke. The progressive release of chemicals and unknown substances in aquatic environments have been followed by the concern to understand the dynamics of these xenobiotics in different ecosystems, and the toxic effect resulting from the disposal of their waste, so the present study aimed to evaluate the genotoxicity nanoparticles of titanium dioxide, inorganic lead and the association of the two contaminants in fish species Hoplias lineatus through water contamination. Characterization of titanium dioxide nanoparticles were performed with transmission electron microscopy, dynamic light scattering, and X-ray photoelectron spectroscopy, prior to their use in the exposures. 75 H. lineatus juvenile specimens were subjected to acute water contamination (96 hours) at concentrations of 0.033 mg PbII/L, 100 mg Ntio2/L, the combination of both contaminants, at the same concentration as above, and 5 µg MMS/g of animal weight as positive control. Also, a negative control was carried along the experiment. The genotoxicity endpoints used in this study were the frequency of micronuclei, considering nuclear alterations, using erythrocytes and the comet assay which was realized for blood, gills, liver, kidney and brain tissue. Synergy between inorganic lead with titanium dioxide nanoparticles was not observed, but the Ntio2/Ntio2 presented genotoxicity in gills, kidney and brain tissue. Keywords: fish, nanomaterials, lead, comet assay, micronucleus test.
RP009. Influence of carbon nanotubes (cnt’s) in toxicity to algae unicellular: analysis ultrastructural
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The NTs are composed of graphite sheet (graphenes) which are wound to form a tubular hollow body of cylindrical shape. These graphite sheets are formed by carbon atoms bonded together into a structure similar to hexagonal fused rings, where there are more than two graphite sheets are concentrically rolled nanotubes called multi-walled nanotubes (MWCNTs). There are currently close attention to the potential impacts of these nanomaterials on humans and the environment and its ecosystems. The toxicity tests are a form of active biomonitoring, using test organisms, defined as standardized and cultured individuals in the laboratory, which can provide information on the conditions of an ecosystem against the presence of an environmental impact. Microalgae Pseudokirchineriella subcapitata are unicellular organisms that are able to perform faster and more efficiently than land plants photosynthesis. Its use is based on the exposure of test organisms at various concentrations of one or more substances and environmental factors during a certain period of time. As still lack comprehensive data, it is not clear that risks that can arise from large-scale production of nanomaterials, chronic toxicity of MWCNT - Helix was assessed with the Pseudokirchineriella subcapitata algae through exposure to a known number of organisms to MWCNTs (0.01; 0.1, 1.0, 10 and 100 ppm). The interaction between MWCNTs with cell structures of algae was evaluated by Raman spectroscopy and ultrastructural analysis by transmission electron microscopy (TEM). The test was negative for aquatic toxicity, but there was a significant inhibition at a concentration of 100 ppm for the MWCNT + PEG, the Raman spectrum showed modification of chemical groups in the exposed cells. Under TEM it was observed the presence of MWCNTs within the algal cells. Toxic effects in higher concentration coincided with the internalization of nanoparticles by cells of algae and also it seems to be some modification of chemical groups in its structure, as shown by the different peaks observed in the Raman spectrum.

RP010. Microtix acutu toxicity of nanostructured oxides used as catalysts in catalytic ozonation
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Research has been aimed at finding alternatives to improve the action of catalysts in advanced oxidation process (AOPs) and nanotechnology allows control of the activity and selectivity by adjusting both the particle size (surface effect) and the particle loading degree (electronic effect). Thus, with the growing interest in the development of efficient and low cost photoelectrochemical water splitting cells, which can be used for the storage and transport of solar energy in the form of hydrogen molecules.

RP011. One dimensional Cu-doped titania photoanodes for water splitting application
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In this contribution, the proprieties and performance of Cu-doped unidimensional titania nanotubes based on nanotubes are compared for water splitting application. Titania nanotube arrays were fabricated by electrochemical anodization at 50V, employing ethylene glycol, NH4H and 1% H2O as the electrolyte. Matrices were transferred onto FTO substrates and impregnated with copper salts, followed by annealing. The 1-D photoanodes were tested during photoelectrocatalytic water splitting under acidic (0.5 M HSO4) and alkaline (0.5 M KOH) conditions. The crystal structure, surface morphology, work function, and photo-conversion efficiency properties of the matrices under study were evaluated by various techniques and correlated to their performance. Copper incorporation inside the one dimensional titania structures represents a promising way for the development of efficient and low cost photoelectrocatalytic water splitting cells, which can be used for the storage and transport of solar energy in the form of hydrogen molecules.

RP012. Oxygen Metabolism in the Cardiorespiratory System after an Acute Exposure to Ni-doped Nanoparticles
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There is strong evidence that ambient air pollution particles present a serious risk to human health. Numerous epidemiological studies have shown an association between airborne particulate matter (PM) and increased cardiopulmonary morbidity and mortality. Transition metals are frequent PM constituents and might play a central role in cardiopulmonary disease mechanisms initiated by PM exposure, via increased production of reactive oxygen species by Fenton-like chemical reactions. The aim of this work was to analyze lung and heart oxidative metabolism after an acute exposure to Ni-doped silica nanoparticles (Ni-NP), in order to clarify the molecular mechanisms involved in PM toxicity. Swiss mice (20-25 g) were intranasally instilled with a Ni-NP suspension (1.0 mg Ni/kg body weight), delivered in a single dose. The control group was exposed to a silica NP without Ni. Lung, heart, and blood samples were collected 1 h after the exposure. NP share comparable physicochemical properties with air pollution PM in size (Control: 170 ± 2 nm; Ni-NP: 200 ± 20 nm) and shape, as assayed by TEM. The Ni-NP group showed an increase in tissue O2 consumption (67%; p<0.001) and NADPH oxidase (Nox) activity (41%; p<0.001) when compared with the control group. Moreover, GSH/GSSG ratio was decreased in the treated group (p<0.05). Ni-NP mice also showed an increase in TBARS content in lung (35%; p<0.001). Plasma TBARS level was increased by 54% (p<0.001) in Ni-NP group. In heart samples, O2 consumption rates were decreased in Ni-NP mice (37%; p<0.001). Taken together, the present data indicate that the exposure to Ni-NP induces impaired oxidative metabolism in lung and heart. These findings contribute to the understanding of the cardiopulmonary toxicity of PM exposure, where oxidative stress and inflammation may play a predominant role in association with transition metals present in environmental PM.

RP013. Toxicidade induzida por nanotubos de carbono na linhagem celular HT-22
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Os nanotubos de carbono (NTCs) são nanoestruturas cilíndricas com grande razão comprimento/diâmetro, classificados em SWNT (single-wall carbon nanotubes) e MWN (multi-wall carbon nanotubes), podendo ainda, apresentar diferentes formas de funcionamento. Em virtude de suas propriedades físicas-químicas únicas, os NTC têm grande potencial para aplicações biomedicais, já que são capazes de atravessar membranas celulares. Uma linha de células hipocampal HT-22 é considerada um modelo extremamente útil para estudar os mecanismos de citotoxicidade neuronal, porém ainda há pouco conhecimento dos efeitos tóxicos de NTC em células nervosas. O objetivo deste trabalho foi investigar os possíveis
efectos tóxicos de diferentes NTCs en la maniobra HT-22. As células (5x10^4 células/mL) foram cultivadas e incubadas com SWCNT, SWCNT - COOH e MWCNT em diferentes concentrações (0,5µg/mL; 1µg/mL; 10 µg/mL) durante 24 horas a 37 °C. A viabilidade celular foi determinada pelos ensaios de MTT, Vermelho Neutro e exclusão em azul de Trypan. Para avaliar a resposta antioxidante foi medida a concentração de espécies ativas de oxigênio (EAO) intracelular. Os dados foram submetidos à análise de variância (ANOVA) e as médias comparadas através do teste de Newman-Keuls (n= 0.05). Os resultados demonstraram que: (1) não foi observada queda na viabilidade celular pelo método de exclusão de azul de Trypan nos diferentes tratamentos (p>0.05); (2) Foi observado um aumento de vermelho neutro nas células expostas ao SWCNT-COOH na maior concentração e no tratamento MWCNT nas concentrações de 5 µg/mL e 10 µg/mL (p<0.05); (3) Queda na viabilidade celular pelo MTT foi observada nos tratamentos SWCNT (0,5µg/mL) e MWCNT(10 µg/mL) mas em contrapartida, foi observada aumento da viabilidade celular em todas as concentrações de SW-COOH(p< 0,05); (4) Houve um aumento da produção de EAO nos diferentes tratamentos em todas as concentrações (p<0.05); Portanto, uma breve exposição à NTCs provoca um aumento de EAO e altera a atividade mitocondrial e lisosomal de células HT-22.

Ecosystem Services

RP014: Ecosystem services in urban environments: relations with landscape structure and landscape design

G. Civeira

The growth of urbanization generated a complex matrix where residential uses often overlap with vegetation and productive uses. In this context, is important to ensure the rational use of natural resources in the landscape by analyzing their functions and identify trends in ecosystem services in urban areas. Despite its importance, finding data of ecosystem services in urban environments is still difficult to obtain. Ecosystem services are regulated by landscape structure such as fragmentation, connectivity and heterogeneity. The main objective of this work is to evaluate the ecosystem services provided by green and productive spaces in Buenos Aires city, how landscape structure regulates them and its possible application in urbanscapes designs. Field measurements were performed on different green and productive spaces: urban garden (UG), a semi-natural area (SA), a recreational area (P) and corridors located along the railways (RC). In each of the sampling sites different indicators to assess the ES provided for each environment were measured: Net primary productivity (NPP) and the depth of the soil profile. Landscape structure was analyzed through the assessment of heterogeneity of land uses. The information obtained in the previous items was used for landscape planning by applying the concept of ecological networks (EN). NPP presented differences between land uses: SA presented significantly highest NPP than the other sites. Soil depth also presented significantly differences between land uses: RC presented the highest soil development and P the minimal soil depth. The designed EN small corridors, such as the boulevards of railways (RC), may be a necessary part of the whole design and can also function as corridors for movement. The patches of tree plantations and vegetation are represented by green and productive spaces that act as nodes (SA, P and UG). In urban areas the EN must be designed to mimic the operation of natural areas or nearby reserves, although in this context buildings should be included as nodes and can be represented as special landscape features in the EN.

RP015. Pollination and sustainable agriculture: Measuring the influence of bee-keeping management on bee health in Chile’s Central Valley

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Although Latin America is one of the richest regions in natural resources, agriculture output grew by 1,9 per cent between 1961 and 2007 compared to 2,4 per cent in OECD countries. Therefore, the challenge for the region is to increase agriculture productivity while conserving its biodiversity. Many of the economically most important crops depend on insect pollinators to guarantee the quality and quantity of fruits and seeds. However, factors of different origin disturb the ecosystems which negatively impacts pollinators and thus on the competitiveness of growers. In order to understand this multifactorial problem there is a need to know the interrelations between factors and determine their impact on the agriculture’s most important pollinator, Apis mellifica, and agriculture’s productivity. Therefore, the Fraunhofer Chile Research Foundation in collaboration with Bayer Crop Science has started a pilot Project in Chile’s Central Valley to create a better understanding of the issues affecting bee health, an essential factor for productivity of the intensive agriculture, based on the experience of the Bayer Bee Care programme. A methodology has been developed adapted to the local context, considering a sample of 3 bee hives randomly selected from each of around 70 small, medium and large beekeepers, getting general information about beekeeper’s practices associated with nutrition, chemical treatments, bee mortality, the population structure of the hive, and a sample of bee bread to measure pollen and the prevalence of pathogens relevant for Chile. Some results show an association between migration of hives to southern Chile, which have a higher degree of infection with Nosema spp, unlike that which remain in the central area for pollution and which are mostly attacked by Varroa. On the other hand, there might be a relationship between the type of food (energy vs. protein) and the presence of one or another disease. The overall trend shows an influence of hive management and agricultural practices on the performance of bees in pollination.

RP016. Quantification of Nosema sp. spores in honeybees collected in agricultural system and apiary: could the pesticides be interfering in their prevalence?

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Multiple factors contribute to the decline of bee populations, including pathogens. The Nosemosis is a disease caused by intestinal endoparasites that infect Apis mellifera. These microsporidia induce adverse effects on the health of colonies and its association with agrochemicals could modify its prevalence. Based on these considerations, this study aimed to assess comparatively the infection rate of Nosema sp. in nests of Apis mellifera that are naturally present in agricultural area, where pesticides are frequently applied, and apiary that are located in a vegetation fragment dissociated of agriculture activities. The bees were collected at São Pedro Farm, where orange are cultivated by means of a conventional cropping system, located on the border of the cities of Sorocaba and Votorantim. Sandy rivers across continents: the impact of sediment pollution on benthic invertebrates and epibiotic diatoms assemblages. The Paraná River case study

E. Ebert, National Institute of Limnology(INALI CONICET-UNL) / EcolHydrologi; M.C. Blettler, M. Amiller, National Institute of Limnology / Laboratory of Hydroecology; P.J. Oberholster, CSIR / Natural Resources and the Environment; A. De Klerk, Council for Scientific and Industrial Research; J.C. Truter, Stellenbosch University / Animal Zoology; M. Marchese, National Institute of Limnology; C. Gonzales, Analytical Chemistry-Faculty of Chemical Engineering A collaborative study between the National Institute of Limnology (Argentina) and the Council for Scientific and Industrial Research (South Africa) was performed in the Paraná River, one of the largest in the world, with the aims to determine levels of pollution and its influence on the benthic macroinvertebrates

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and epipelagic diatoms assemblages. We performed the samplings in the main channel, in a large secondary channel of its floodplain, the Colastiné River and in a minor tributary, Las Conchas River. Higher concentrations of As (>5.9 mg/kg), Cr (>37.3 mg/kg) and Ni (>18 mg/kg; according to MacDonald et al. 2000) as well as Cu, Pb, Ni and Zn were found in the Colastiné River approximately 2 km downstream a localized sewage discharge. In addition, diatoms usually associated with organic contaminants were also recorded at this sampling station. Otherwise, dangerous concentrations of heavy metal pollutants were not detected in Las Conchas River as well as in the Paraná main channel. Another sampling station was located near Las Conchas mouth where this tributary joins with a small branch of the Paraná River. Flow velocity diminishes abruptly at this confluence creating favourable hydraulic conditions for sedimentation of fine sediments (silts and clays supplied by the Paraná and Las Conchas). Though the concentrations of As, Cr, Cu, Pb, Hg, Ni, Zn at this site were lower than the admissible limits, their values were 40-100% higher than in the other sampling stations along the Paraná and Las Conchas Rivers. This fact would show the potential of localized areas to accumulate pollutants along river channels. Note that areas where the interaction of morphology and hydraulics prompts sedimentation seem to be optimal places to measure pollution since, otherwise, pollutants would be carried in suspension without been detected in a current bottom sediment sampling. Furthermore, the invasive bivalve Limnoperna fortunei was only recorded in the areas of highest concentration of pollutants (at the confluence station and downstream of sewage discharge). This species has the potential for bioaccumulation of pollutants, making them available when ingested by fish predators. This study shows that sampling techniques may be improved with interdisciplinary approaches involving the interaction of river morphology, flow configuration, sedimentology and ecotoxicology.

**RP018. Urban trees: contributions to public policy of air decontamination. Case of Santiago, Chile.**

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Trees contribution to ecosystems services in wild and urban environment has long been documented. Trees capture contaminants, between many other services. In Santiago the absorption of particulate matter and gases has been reported; calculations were done using models with parameters partially coming from other countries. Trees also emit volatiles organics compounds, VOC’s, called biogenic volatiles organics compounds, BVOC’s, affecting the urban ozone (O3) production. In Santiago, O3 exceeds the national regulation in certain areas in spring-summer period. In the Metropolitan Region of Chile, it was establish in 1998 the decontamination and prevention plan, as a response to saturation zone for 4 pollutants, including O3. In 2010 the government launched the program “Un chileno un árbol” projecting 17 million trees by 2018. These new trees would be added to the existing ones. The scientific basis proposing this number or the species to be planted are unknown. At present, the majority of species are exotics. Previous studies of our group show a more potential production of O3 from the exotics species than from the native ones. In this work, in order to assess the contribution of BVOCs on O3 formation, background on inventories of trees were collected in the 32 communes of the province of Santiago; significant differences were found in the type and quality of the information; a complete inventory of urban trees were found in 3 communes and not information at all in other 12. In other cases partial information was obtained. The inventories are heterogeneous, in method applied and period developed. Also a pollen register was considered using the information of a private Monitoring Station in Santiago, since O3 interaction with pollen grain has been observed increasing the release of antigens, causing allergic; rhino conjunctivitis is predominant in Santiago, in spring. We propose that to contribute to establish decontamination of the air linked to trees contribution, it’s necessary, at least: a) to know the total number of different trees species, their emission factor of BVOCs and the quantity and quality of pollen emitted; b) Recalculate the emission inventories to the different communes, establishing the difference of each contribution; c) Make an emission map, facilitating to take more effective decisions; d) Normalize periodically the trees inventories; e) Identify the species to reforest and recommend the location and quantity of each one.

**Ecotoxicological effects of conventional and non-conventional petroleum extraction and waste**

*RP019. Evaluation of the toxicity of the water-soluble oil fraction in the freshwater crustacean Hyalella curvispina*

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Oil and gas extraction is one of the main economic activities in Neuquén Province-Argentina. Although all the productive steps are environmentally regulated, spill events occasionally occur affecting water courses. The aim of this work was to evaluate the chronic toxicity of water-soluble oil fraction (WSF) in the autochthonous amphipod H. curvispina. Adults (3-4 mm) were exposed to five progressive dilutions of WSF, and the exposure media were renewed at 7-14 d registering mortality up to 21 d. At the end of the exposure, individuals were collected to determine glutathione-S-transferase (GST) activity. The chemical analysis of WSF was also analyzed by gas chromatography. Aryl hydrocarbons (AH) were the main component (C8-C18 0.059 mg/L; C18-C25 0.012 mg/L; C25-C33 0.010 mg/L), while trace quantities of PAH were detected. The LC50 was assessed by non-linear fitting of logistic mortality model to data. At 14d, the LC50 corresponded to 0.16 mu g/L; 0.17 mu g/L and 0.41±0.17 mu g/L total AH, the toxicity increased at 21d, with a LC50 equal to 1.345 WSF dilution, about 0.23±0.14 mu g/L total AH. The mortality slope was very smooth (lower than 1: 0.54 and 0.68 at 14d and 21d respectively), indicating a high influence of individual sensitivity to the WSF components. Dilution of WSF to 1:50 caused a highly significant induction of GST activity (45%) compared to controls, suggesting the utility of this parameter as a biomarker. The induction of this enzyme resulting from exposure to WSF components from oil is an expected detoxifying response accompanying Phase I detoxification.

**RP020. Induction of carboxylesterase and GST activity in rainbow trout Oncorhynchus mykiss by water soluble fraction obtained from a natural petroleum spill**

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A natural petroleum spill affects Las Minas stream (41°17'21''S, 71°10'58''W, Río Negro Argentina), in which the rainbow trout, Oncorhynchus mykis, is abundant throughout the year. We assayed possible biomarkers of exposure to petroleum aromatics hydrocarbons (PAH): carboxylesterase (CEs) activity and glutathione S-transferase (GST) activity. Our aim was to determine the effects of petroleum water soluble fraction (WSF) on O. mykiss liver and gill CEs and GST. WSF was prepared as 4.75 g crude petroleum (obtained from the spill) per L of river water. Juvenile fish (3.5 ± 0.6 g) were exposed to 5% WSF (237 mg L-1) for 24h (n = 8) and 96h (n = 8), using the same number of fish as control. Gills and liver were homogenized and the 11000 x g, 15 min supernatants were used for enzyme activity measurements. CEs activity was determined using p-nitrophenylacetate (p-NPA) and p-nitrophenylbutirate (p-NBF) as substrates, reading absorbance at 400 nm for 1 min. GST activity was measured according to Habig et al. (1974) reading absorbance at 340 nm for 5 min. Protein concentration, determined through Bradford’s method, was used to calculate enzyme specific activities. In all the groups, CEs activity measured with the substrate p-NFA was higher than the obtained using p-NBF (10.9 ± 3.8 vs. 8.1 ± 1.4 nmol min-1 mg protein-1; P < 0.001). In liver of exposed fish, CEs activity measured with the substrate p-NFA was higher than in control fish (P < 0.01), both at 24h and 96h. In contrast, there was no significant difference between treatments when p-NFB was used. In gills, CEs activity did not change at 24 h of exposure to WSF respect to the control but was increased at 96 h, irrespectively of the substrate used (P < 0.001). However, the response observed at 96 h was higher when p-NPA was the substrate (77%) compared with the obtained with p-NBF (25%). In general, GST activities ranged from 13 to 105 nmol min-1 mg protein-1. Liver GST activity was induced by exposure to WSF at 24h (68% P < 0.01) and at 96h (123 % P < 0.001), while gill GST activity increased only at 96h (70% P < 0.01). This indicates that O. mykiss liver CEs (measured with p-NFA as substrate) and GST activities are sensitive biomarkers for oil contamination. Gill CEs and GST activities could be useful as biomarkers of PAH effects but only for detecting more prolonged exposure.

**Water management, science and policy: salinization problems in Argentina as a South American study case**

*RP022. Destruction of toxic waste generated in veterinary practices of histopathology labs by supercritical oxidation*

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The efficiency of destruction was of 99.6% with the
community, detoxification, physiological stress and
responses in Mytilus galloprovincialis were
epartamento de Ciências Biológicas
R. Lobato
Universidade Federal do Rio Grande / Departamento de Fisiologia; J. Ventura-Lima, FURG Universidade Federal do Rio Grande / Departamento de Ciências Biológicas

Toxicology and OMICs: bridging the gap between gene and
whole animal responses.

RP023. Antioxidant responses in Mytilus galloprovincialis in Cape Town, South Africa

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Cape Town is a very popular South African tourist destination that attracts large numbers of international tourists. Although monitoring of metals along the coast takes place, not much biomarker research has been done in the area. Metal concentrations and antioxidant responses in Mytilus galloprovincialis were determined from samples collected at Scarborough, Hout Bay, Green Point, Milnerton and Bloubergstrand in Cape Town, South Africa in March 2011. Antioxidant responses were determined based on antioxidant enzyme activity for catalase (CAT), superoxide dismutase (SOD) and reduced glutathione (GSH). Antioxidant enzyme gene biomarkers were determined using ferric reducing antioxidant power (FRAP) and oxygen radical absorbance capacity assay (ORAC). The lipid peroxidation reactions were determined by conjugated dienes (CD) and thiobarbituric acid reactive substances (TBARS) to determine cellular oxidative damage. The results indicated statistically different biomarker responses between sites which could have been related to metal concentrations. Compared to international standards, none of the sites sampled were considered polluted, but by using antioxidant responses as biomarkers, a comparative level of stress, possibly induced by metal contamination, was determined for the sites sampled. Metal concentrations and antioxidant responses in M. galloprovincialis suggested that antioxidant responses could be used as biomarkers of toxicity in the region.

RP024. Avaliação do papel do antioxidante Ácido Lipídico suplementado via dieta frente à exposição de cobre no camarão branco Litopenaeus vannamei.

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Litopenaeus vannamei, é uma espécie de camarão mais cultivada, essa produção é susceptível a estressores ambientais, entre eles o cobre (Cu). Cu é naturalmente encontrado nos ecossistemas, sendo essencial fisiologicamente, em altas concentrações pode induzir estresse oxidativo, sabe-se do aumento nos níveis de Cu em cultivos colocando em risco a saúde dos animais. O Ácido Lipídico (AL), é uma estratégia de quimioprevención, sendo um antioxidante poderoso contra as espécies ativas de oxigênio (EAO). O objetivo do estudo foi avaliar a suplementação com AL 70mg/Kg/ração, via dieta, visando melhorar a resistência do animal frente à exposição ao Cu (1mg/L) por 48 hs. Foram utilizados músculos, brânquias e hepatopâncreas. Os resultados obtidos mostram que o Cu induziu um aumento na produção de EAO em brânquias e hepatopâncreas, enquanto os tratamentos que receberam o AL (via dieta) por 30 dias diminuíram estas espécies. O Cu modulou a atividade da enzima glutamato cisteína liga (GCL), não tendo diferenças significativa em nenhum tratamento no músculo, nas brânquias um aumento significativo foi visto na atividade da GCL no grupo exposto somente ao AL comparado a todos os tratamentos, já a exposição ao Cu diminuiu a atividade da enzima e a co-exposição, reverteu está inibição, no hepatopâncreas o AL não alterou a atividade da enzima em relação ao controle, enquanto o Cu diminuiu sua atividade. Os níveis de glutatona reduzida não diferenciou entre os tratamentos independe do tecido analisado, danos oxidativo lipídico foram verificados em brânquias e hepatopâncreas, o tratamento somente com o AL modulou o sistema de defesa somente nas brânquias. Neste estudo a co-exposição ao Cu e AL não mostrou melhorar os efeitos gerados pelo Cu, talvez pela alta concentração do metal. No entanto, a exposição ao Cu mostrou induzir estresse oxidativo em brânquias e hepatopâncreas, portanto a suplementação de AL na ração para evitar danos induzidos pelo Cu não parece ser efetiva neste caso.

RP025. Bottlenose dolphins as environmental sentinels: A review on contamination and health assessment through the use of molecular biomarkers

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Industrial and agricultural activities are a major cause of environmental contamination, discharging a variety of toxic compounds such as trace metals and persistent organic pollutants (POPs) that accumulate in higher trophic levels. As top-level predators, odontocetes are highly susceptible to health impacts associated with these chemicals, and resident populations become important sentinels to local and chronic environmental contamination. Systemic comprehension of how these chemicals affect physiological, cellular and biochemical pathways still elude us, but some molecules have been pointed as potential biomarkers for cetacean detoxification and immunological response to pollutants. While there are many established biochemical biomarkers, such as CYP1A1 and CYP2B protein expression and enzyme activity, this study focuses on an up to date review of the frequently studied and most important molecular biomarkers of aquatic contamination for Tursiops truncatus, a highly cosmopolitan species widely used in aquariums and, as such, one of the most studied cetacean species worldwide. Keywords searches on PubMed and Google scholar search engines yielded more than thirty potential molecular biomarkers and potential candidates for use in cetacean research and monitoring. Expression levels of cetacean-specific genes of interest: IL-4, IL-6, IL-10, IL-12, IL-13, IL-18, INF-γ, TNF-α and TGF-β, as well as cytokine receptor IL-2R have been proposed as immunological biomarkers. In vitro exposure to MeHg and FPOs rendered potential biomarkers to cellular stress and life cycle functions, such as actin, taurin B, a mitogen activated protein kinase MEKKS and collagen type XII, as well as an antioxidant biomarker: aldose reductase. Furthermore, the microarray technology recently used in T. truncatus to search for molecular responses to PCBs exposure, pointed to new potential biomarkers such as signal transducer and activator of transcription 1 STAT-1, nuclear receptor subfamily 3 NR3C1, complement component 1q C1QB, interferon regulatory factor 2 IRF-2, HSP-70, activin A receptor type II-like ACVR1-1, periplin 2 PLIN-2 and dual-specificity phosphatase 2 DUSP-2. Finally, genes involved in immunity, detoxification, physiological stress and cellular pathways have been identified in bottlenose dolphins, but few studies have effectively provided valuable molecular biomarkers to assess aquatic pollution and/or associated health impacts in this species. Thus, this is still a novel and promising tool for environmental conservation.

RP026. Curcumin induces glutathione/glutathione s-transferase couple in tissues of pacific oysters Crassostrea gigas

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NF2 is an essential transcription factor for the coordinated induction of genes encoding antioxidant enzymes, glutathione synthase enzymes, glutathione S-transferase, hemoxigenase, among others. This action is dependent on binding to the antioxidant response element (ARE) of target genes. The induction of NF2/ARE pathway offers enormous potential for antioxidant protection; however, there is no research on this pathway in bivalves. The objective of this study was to search for possible inducers of NF2/ARE in Pacific oysters, Crassostrea gigas. We used curcumin (CUR), a classical NF2 inducer, added to the water without replacement at 10 or 30 mM for 24, 48 or 96h. There was an increase in GST activity in the gills (30 °M) in all time points, and GSH at 96 hours. These changes were not observed in the digestive gland. Transcription of the gene encoding pGST (24 h) in gills increased more than 4 times, while the αGST isomorph was not affected by CUR treatment. The transcription of glutathione-cysteine ligase (GCL), the rate limiting enzyme for GSH synthesis, was increased approximately 3-fold (24 h), and the gene coding for MDR increased more than 60 times. The data point to a robust induction of glutathione synthesis and GST transcription and activity in oyster gills treated with CUR 30 °M, suggesting an activation of the NF2 pathway, which is known to induce GST and GSH synthesis. The data suggest that the transcription factor NF2 is functional in bivalve gills. Additional experiments are in course to confirm the existence of a functional NF2/ARE in bivalves.

**RP027. Dieldrin exposure affects the expression of dopamine and GABA receptor subunits in zebrafish (Danio rerio) embryos**

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Dieldrin is a legacy organochlorine pesticide that was used in North America agriculture from the 1950-1980s. Despite discontinued use, dieldrin remains present in the sediment of some agricultural regions because it is a long lived chemical and it is resistant to microbial degradation. In addition, dieldrin readily bioaccumulates in fatty tissues of organisms. To better understand how this pesticide may affect developing organisms that are present in the benthic sediment, we exposed both chorionated and dechorionated zebrafish embryos to a concentration range of dieldrin (3.46 x10^{-3} mM, 0.346 x10^{-3} mM, 3.46 x10^{-4} mM, 3.46 x10^{-5} mM) for 48 hours. Following 48 hours, some larvae were allowed to experience a six-day depuration period. Dechorionated fish were more sensitive to dieldrin and displayed a higher percentage of mortality compared to chorionated embryos, a result of direct exposure to the chemical. Dieldrin exhibited delayed toxicity in embryos, and there was 75% and 66% mortality of dechorionated and chorionated fish following a 6-day depuration period in the highest treatment group. Morphological deficits that included cardiac edema, cardiac herniorrhaging, skeletal deformities, and lethargy were noted in larvae exposed to dieldrin. Real-time PCR revealed that exposure to dieldrin altered dopamine receptor expression (drd1, p=0.040) and drd2a (p=0.036) in one week old zebrafish. There were also differences in mRNA levels between chorionated and dechorionated embryos for GABAA receptors that included gabrb1 (p=0.046) and gabrb2 (p=0.038). This study suggests that dieldrin can cause delayed toxicity and deformities in developing fish embryos and can alter the normal expression of dopamine and GABA receptor subunits in development. This is significant as exposure to dieldrin has been associated with an increased risk to neurodegenerative diseases.

**RP028. Effects of benzo(a)pyrene in activity and expression of cyp1a in teleost Prochilodus lineatus**

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Benzo(a)pyrene (BaP) is one of the best known and studied polycyclic aromatic hydrocarbons (PAHs). It induces the activity of xenobiotic biotransformation enzymes, precluding expression of these biotransformation enzymes, precluding expression of these biotransformation enzymes. For this purpose, a concentration range of BaP (201.8 μg/L PHEN or an ethanolic solution of benzo(a)pyrene dissolved in canola oil (20 mg.kg-1). The animals of OIL group (n = 6) received an equal volume of canola oil (2 mL.kg-1). After 24 h of the injection fish were killed for the removal of the different contaminants. Results showed that the activity of CYP1A, the gene encoding for CYP1A (in the gills), the concentration of the non-enzymatic antioxidant glutathione (GSH) and the occurrence of lipid peroxidation (LPO) in the liver of the Neotropical fish Prochilodus lineatus. For this purpose, we used juvenile specimens of P. lineatus (11.96 ± 0.58 cm; 20.23 ± 2.26; n=12), supplied by the Hatchery Station of Londrina State University and acclimated in the laboratory for five days. Fish were divided into two groups (OIL and BaP). Fish of BaP group (n = 6) received a single intraperitoneal injection of benzo(a)pyrene dissolved in canola oil (20 mg.kg-1). The animals of OIL group (n = 6) received an equal volume of canola oil (2 mL.kg-1). After 24 h of the injection fish were killed for the removal of the different contaminants. Results showed that the activity of CYP1A, the gene encoding for CYP1A (in the gills), the concentration of the non-enzymatic antioxidant glutathione (GSH) and the occurrence of lipid peroxidation (LPO) in the liver of the Neotropical fish Prochilodus lineatus. For this purpose, we used juvenile specimens of P. lineatus.

**RP029. Gene expression analysis in female fathead minnow following sub chronic exposure to phenanthrene**

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Phenanthrene (PHEN) is a polycyclic aromatic hydrocarbon (PAH) found in the environment and is produced following human activities such as oil extraction and coal mining. PAHs have been previously shown to induce oxidative stress, and impair immune and reproductive systems in fish. In this study, female fathead minnows (P. promelas) were exposed to a single average measured concentration of 201.8 µg/L PHEN or an ethanol control for ~7 weeks. Ovary tissues were dissected for in vitro 17β-estradiol (E2) production and histological analysis. Liver tissues were collected for gene expression analyses. Exposed FHMs had a lower condition factor and had smaller ovaries compared to control fish. The production of E2 from the ovary of control and treated fish did not differ; however FHMs exposed to PHEN had a higher proportion of perinucleolar oocytes and a decreased proportion of vitellogenic oocytes, when compared to proportions in control fish. In the liver, microarray analysis indicated that there were 628 differentially expressed genes. These genes included MHC class I antigen, vitellogenin 3, and epidermal growth factor receptor. Parametric Analysis of Gene Expression suggested that there was an increase in energy production at the gene level, and genes related to detoxification and immune system were also affected by PHEN. This study corroborates others that show sub-chronic exposures to PHEN can impair reproductive, detoxification, and immune system processes in fish. It is hypothesized that FHMs may be utilizing energy resources to mitigate stress responses, subsequently reducing energy available for reproduction.

**RP030. Reference gene selection for qRT-PCR analysis in scallops Nodopencten nodosus**

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Bivalve mollusks are used as sentinel organisms to monitor exposure to a variety of chemical compounds. Scallop Nodopencten nodosus has a wide geographic distribution and is susceptible and sensitive to the toxic effects of a large number of contaminants, besides their economic value. Real-time quantitative reverse transcription PCR (qRT-PCR) has become a routine technique for mRNA expression analysis, due to its high sensitivity, specificity and throughput. This technique however can have considerable experimental error and variation. To minimize these variations, normalization to an internal control, referred as a housekeeping or reference gene, is usually employed. Systematic evaluation of reference genes that can be used among tissues of N. nodosus exposed to contaminants is lacking. In this study, nine commonly used candidate as reference genes were selected from the transcriptome data of N. nodosus for suitable qRT-PCR reference genes identified in gills: 18s ribosomal protein, 28s ribosomal protein, 110 reference gene selection for qRT-PCR analysis in scallops Nodopencten nodosus.
method and only two genes were recommended for qRT-PCR normalization (EFl and 40s) for scallops gills following PHE exposure.

RP031. Role of p2x7 purinergic receptor in the exposure of benzo[a]pyrene in zebrafish

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Benzo[a]pyrene (BaP) is a Polycyclic Aromatic Hydrocarbon (PAH), resulted of the incomplete combustion of organic material, as wood and fuel, present in the air, water, soil, food and cigarette smoke. It is a highly toxicant and carcinogenic environmental contaminant, able to produce endocrine and immunologic disruption. BaP Metabolism occurs by Aryl Hydrocarbon Receptor (AhR) activation, which in turn induces cytochrome P450 enzymes, resulting in genotoxic compounds, as BaP-7,8-diol-9,10-epoxide. This process uses a lot of oxygen, and generates oxidative stress and inflammation. The P2X7 purinoreceptor is an ATP-gated ion channel, involved in many cellular processes, as inflammation, immunity and cytotoxicity, and is a potential biomarker and therapeutic target in diseases. Its activation promotes ion flux (Ca2+ and Na+ influx, and K+ efflux) and modulates several cell signaling pathways by forming a non-specific pore permeable to small molecules. The goal of this study was to evaluate P2X7 receptor modulation during BaP exposure and inflammation. We used zebrafish (Danio rerio) as a model of exposure of BaP. The animals were divided into four groups: (1) control group, (2) BaP exposure group, (3) BaP exposure and concomitant intraperitoneal injection (CPI) of P2X7 agonist Bz-ATP and (4) BaP exposure and CPI of P2X7 antagonist A438079. The experiment lasted six days, cDNA was produced from the gills and then we evaluated the gene expression of CYP1A1, CYP1B1 and IL-1b by qPCR. The expression of all these genes was increased on groups 2 and 3, evidencing the metabolism of BaP and the inflammatory effect. On group 4, the expression of all these genes was statistically equal to control group, what shows that the antagonist A438079 has blocked the P2X7 receptor and prevented inflammation, in addition to the blockage of CYP1A1 and CYP1B1 expression. Besides the mechanistic significance, the results lead to the conclusion that chemicals capable to block P2X7 receptor, as zinc, copper, and 17b-estradiol, can underestimate the levels of BaP in the environment when these genes are use as biomarkers. Furthermore, compounds that reduces BaP metabolism may be useful to decrease the levels of metabolites and to produce less toxicity (which will be proved by Comet Assay).

RP032. Study of biochemical markers in tuvira (Gymnotus sp.) exposed to diuron and its degradation products

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Despite the herbicides’ high selectivity in reaching and combating pests and weed (target organisms), it can affect directly or indirectly the lives of many non-target organisms, e.g. fish. Therefore, studies that measure contaminants (target organisms), it can affect directly or indirectly the lives of many non-target organisms, e.g. fish. Therefore, studies that measure contaminants in non-target organisms are fundamental to propose new considerations and implications of utilizing herbicides in agricultural crops. Among all existing pesticides, the diuron is highlighted, an herbicide containing a high toxic potential to the non-target species. Additionally, it can be biodegraded in other composites such as the 2,4-dichloroanilin (DCA), 3-(3,4-dichlorophenyl)-1-methylurea (DCMPU) and 1-(3,4-dichlorophenyl) (DCPU), that can be even more toxic than the diuron itself. Thus, the main goal of this study is to evaluate the diuron effect and its three main degradation products, DCA, DCMU and DCPU, in the biochemical parameters of the gymnotus sp. All fish were exposed to different contaminants (treatments) for 2 and 6 days, being diuron, DCA, DCPU and DCMU, concentration of 0.5 mg.L-1, and a baseline treatment control group (not exposed to the contaminants). After that period the activity of the following substances was measured inside of the fish’ stomach: Ethoxyresorufin-O-deethylase (EROD), glutathione transferase (GST), catalase (CAT) and glutathione peroxidase (GPx). The results regarding EROD, GST and GPx activities were compared among treatments for both exposure times. However, the CAT activity increased significantly in the treatments DCPU and DCMU after the 6 days exposure. Moreover, the DCA caused 100% mortality before the 6 days exposure period, highlighting a significant toxicity if compared to the original compost, the diuron. The induction on the production of reactive oxygen species (ROS), increases the activity of antioxidant enzymes such as catalase, thus the increase in the CAT activity indicates that the DCPU and DCMU treatments can cause oxidative stress in fish and can me more toxic than the diuron itself. Therefore, it can be concluded that the diuron herbicide and its degradation products represent a threat to the aquatic environment, and can lead to the extinction of teleosts.

Harmful Algal Blooms and Phycotoxins

RP033. Cyanobacterial blooms in oligotrophic north patagonian lakes of Chile - a genomic approach.

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It is known that harmful blooms of cyanobacteria have adverse effects on aquatic organisms and even on human health, since many species have the potential to synthesize dangerous toxins. In Chile studies on cyanobacteria and their potential toxicity have been very scarce. In recent years massive developments of cyanobacteria have been recurrent in oligotrophic North-Patagonian, mainly constituted by Microcystis and Dolichospermum species (former Anabaena sp.). In order to identify the potential toxicological risk associated to these massive cyanobacterial developments six North Patagonian lakes (Lakes Caburgua, Villarrica, Calafquen, Panguipulli, Ranco and Puñeyue) were sampled during the summer period and assessed for the presence of both cyanobacteria and cyanotoxins. The results of this survey revealed for the first time the presence of microcystins in all studied lakes, however other cyanotoxins such as cylindrospermopsin, saxitoxin and anatoxin were tested negative in the surveyed lakes. Applying molecular techniques Cylindrospermopsin raciborski was found in Lake Ranco constituting the first report of this algae in a Chilean lake. Then present study highlights the importance of molecular methods as a first approach to describe cyanobacteria and their potential production of cyanotoxins in Chilean North-Patagonian lakes.

RP034. Effects of a cyanobacteria extract in zebrafish housekeeping genes and glutathione s-transferases

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Fishes are occasionally exposed to toxic cyanobacteria blooms that produce microcystins (MCs) in the aquatic environment. Glutathione S-transferases (GSTs) are important biotransformation enzymes that conjugate MCs with reduced glutathione (GSH) and represent an important defense mechanism against MCs toxicity. The mRNA levels of eight housekeeping genes and eleven GST isoforms and housekeeping genes after experimental treatment using the E. coli strain RST 9501 cultivated in laboratory and originated from the Patos Lagoon Estuary (South Brazil, RS). This extract was diluted to expose fishes to 5 and 50 µg.L-1 of D-Leu1-MC-LR and control group and after the acclimation period the fishes were individually separate in beakers, n = 10 per experimental group. The best housekeeping genes were analyzed based on their levels of stability (the “M value” using Data Assist, Applied Biosystems) and the genes that showed the best stability score were β-actin, amt and b2m for liver and β-actin, amt and 18s for gills. The average of the Cts (threshold cycle) for those housekeeping genes was used to normalize the mRNA expression levels of the GST isoforms and housekeeping genes after experimental treatment using the E-ΔCt method. The extract containing 5 µg.L-1 of D-Leu1-MC-LR caused the transcriptional induction of tpb mRNA level in the gill (1.8 fold control) and GST kappa mRNA levels in the liver (5.6 fold control) in exposed fishes. In addition to pure MCs other components present in cyanobacteria extract may present toxicity to organisms and we suggest that the extract did not caused a strong change at transcriptional level of various GST isoforms due to the interaction of other compounds present in the extract of cyanobacteria M. aeruginosa not regulate responsive elements present in the promoter region of these GST isoforms. We conclude that some housekeeping genes show different levels of stability for the experimental conditions and some GST isoforms and housekeeping genes were altered at the transcriptional level in D. rerio by relevant environmental levels of D-Leu1-MC-LR in M. aeruginosa extract.

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RP035. Effects of subchronic exposure to microcystin-variant in the crude extract of Radiocystis fernandoi on the Neotropical fish (Hoplias malabaricus)

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Microcystins is toxic to fish. It can accumulate in the fish tissues causing and changes in liver structure. This study evaluated the bioaccumulation potential of the majority microcystins in the crude extract of the cyanobacteria Radiocystis fernandoi cepa R28 on the fish Hoplias malabaricus after subchronical exposure and their effect on the liver by assessing the liver structure and the detoxification process. Fish were intraperitoneally injected with 100 μg MC-LR eq kg-1 every 72 hours. Biochemical and morphological biomarkers were used to evaluate the action of toxins, structural and ultrastructural damage and the detoxification mechanisms. The quantification of microcystins on the crude extract and accumulation in muscle and liver were assessed by HPLC-UV and HPLC-MS. The R. fernandoi R28 strain produced mainly the MC-RR and MC- YR that have hepatotoxic potential. There were bioaccumulation of MC- YR and MC-RR in liver and there was not MC accumulation in muscle. The alanine aminotransferase and aspartate activity in plasma and the serine protein phosphatase/threonine PP2A was inhibited in the liver indicating liver damage. Macroscopically occurred changes in the color, texture and liver mass; microscopically the morphology of hepatocytes and intracellular organelles were altered and abundant fibrous tissue disrupted the architecture of the liver parenchyma. Moreover, the inhibition of detoxification process was evidenced by decreasing the GSH content and GST activity. In conclusion, the bioaccumulation of the microcystins depends on concentration and body's defense systems. The changes observed in liver biochemical variables and structure evidenced functional impairment of the organ suggesting that the microcystin present in the crude extract of cyanobacteria R. fernandoi (R28 strain) compromise the animal health and may affect growth, reproduction and even survival after long term exposure. Financial support: FAPESP Proc. 2012/00728-1; CEMIG Proc. GT346; CNPq/INCT-TA Proc. 573949/2008-5.

RP037. Potentially toxic evaluation of Microcystis aeruginosa and Cylindrospermopsis raciborskii on Ceriodaphnia dubia

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The various sources of point and diffuse pollution reach water bodies and end up triggering several injuries, including eutrophication and subsequent algae blooms. The Iparraguirre reservoir has suffered with the constant presence of cyanobacteria and these may release large amounts of cyanotoxins when blooms occur. For this reason, this paper explored the toxicity of two species of cyanobacteria possibly toxics from the said reservoir, Cylindrospermopsis raciborskii and Microcystis aeruginosa through ecotoxicological tests with Ceriodaphnia dubia. Surface samples of the C. aeruginosa phytoplankton were collected, after isolation and axionation, the species were grown in 9L polycarbonate bottles in ASM-1 and pH 7 (8L). Subsequently, the cultures were concentrated in continuous-flow refrigerated centrifuge at 6000 rpm and 25 ml/min. The biomass obtained was frozen in liquid nitrogen and lyophilized. Moreover, the analysis of death test was performed by HPLC according to methods described by Ferрé-Filho et al., (2009), and analyzed microcystin (Mic) as Spoof et al. (2003) and saxitoxins (Sax) according Oshima (1995). The ecotoxicological tests occurred exposing the test organisms to concentrations of 1 and 5 μg L-1 Mic and 1.5 and 7.5 μg L-1 Sax, the experimental conditions were based on the recommendations of ABNT NBR 13737 (2011). There were carried out statistical analysis, t-test for two means and Dunnett's adjustment (reproductive parameters) and Kruskal-Wallis test (mortality) to assess the potential acute and chronic toxicity of tests. As a result, concentrations for Mic and Sax were 440 ng mg-1 and 48 ng mg-1, respectively. Under those circumstances, it was observed acute toxicity in the tests with Mic and chronic toxicity with Sax, therefore the two isolated species have shown to be potentially toxic. Given the above, it is evident the possibility of compromising the quality of the water resources, which limits their multiple uses, considering both human consumption and the possibility of injury to the protection of aquatic life.

RP038. Quimioprevenção mediada pelo Ácido lipóico frente à toxicidade induzida por Saxitoxinas na linhagem celular HT-22

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As saxitoxinas (STXs) são neurotoxinas produzidas por cianobactérias como Cylindrospermopsis raciborskii. Toxicologicamente, as STXs bloqueiam canais de sódio dependentes de voltagem em neurônios. Podem ser prejudiciais aos organismos aquáticos, causando eutroficação e subsequente algas sobre florescência. O Parque Estadual do Lavíno, em Santa Catarina, tem ocorrido algas sobre florescência causada por C. raciborskii, com altas concentrações de STXs. Por isso, este estudo objetivou apresentar a quimioprevenção mediada pelo Ácido lipóico frente à toxicidade induzida por Saxitoxinas na linhagem celular HT-22.

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Cyanobacteria proliferation is a threat to aquatic environments, mainly because they may produce potent toxins, the microcystins (MCs), which has been associated with mortality of fish. The objective of this study was to evaluate the hepatic enzymatic antioxidant system of Hoplias malabaricus injected with MCs present in the crude extract of cyanobacteria Radiocystis fernandoi. Fish were intraperitoneally injected with 100 μg MC-LR eq kg-1 body mass, every 72 hours during 30 days. The biochemical biomarkers (SOD - superoxide dismutase, CAT – catalase and GPX - glutathione peroxidase) were analyzed to assess the liver response to reactive oxygen species (ROS). Membrane damage ratings were done using markers of lipid peroxidation, measured by the TBARS assay, and protein carbonylation and genotoxicity was assessed using the Comet assay. The activity of the SOD-CAT system increased by 31% and 68%, respectively, indicating the production of reactive oxygen species (ROS). Conversely, the activity of GPX decreased 58%, indicating the inhibition of enzyme synthesis or its activity. The production of reactive oxygen species (ROS). Conversely, the activity of GPX decreased 58%, indicating the inhibition of enzyme synthesis or its activity. The reduction of MDA (63%) and protein carbonylation indicate an efficient SOD- CAT response. However, the Comet assay indicates an increase by 72% in DNA damage in the liver cells, indicating which the production of ROS induced genotoxicity. Although, oxidative stress was not observed, the responses of the liver antioxidant system and DNA damage suggest that the MC present in the crude extract of cyanobacteria Radiocystis fernandoi may result in functional impairment of the organ after long-term exposure. Financial support: CEMIG Proc. GT346; CNPq/INCT-TA Proc. 573949/2008-5; FAPESP Proc. 2012/00728-1.
observed to have cytotoxic effects in fish embryos, so the use of suboptimal conditions (the light cycle) can affect the aquatic fauna. A broad definition of biological control is the use of organism or its products with a capacity of prey, compete, delete, or parasitize another. The objective of this study was to evaluate the intake/filtration rate of toxic cyanobacteria Microcystis aeruginosa and Cylindrospermopsis raciborskii by Geophagus brasiliensis and Oreochromis sp. that are possible to use as biological control of initial episodes blooms. However it’s necessary an assessment of ecotoxicological effects of cyanobacteria in these cichlids through lipoperoxidation level and activity of antioxidant enzymes. Four experiments were conducted containing two sizes of cichlids (T1 fish 5-10 cm; T2- fish 10-15 cm) and three initial concentrations 10 µg/L, 20 µg/L and 40 µg/L of cyanobacteria cited above, the experiments lasted 96 hours under controlled conditions. To evaluate the effects of these cyanotoxins in these organisms the following biochemical analyses in liver and gills were performed: lipoperoxidation (LPO), evaluating oxidative damage and the activity of antioxidant enzymes catalase (CAT) and glutathione s-transferase (GST). The present study revealed a general pattern that both species of cichlids showed some biochemical changes when subjected to cyanotoxins tested here and in the time and concentrations of experiment does not appear to cause permanent damage, as these appear to have been corrected by antioxidant enzymes. It is necessary studies with larger experiment time of intake/filtration of these cyanobacteria to validate the cichlids as effective biological controls.

Ecotoxicology (effects of pollutants)

RP039. Toxic cyanobacterial cells induce oxidative stress in fish under laboratory conditions
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Cyanobacterial blooms in water bodies are a worldwide problem caused by the anthropogenic activities. Cyanobacteria have considered toxic substances that can affect a diversity of organisms. A broad definition of biological control is the use of organism or its products with a capacity of prey, compete, delete, or parasitize another. The objective of this study was to evaluate the intake/filtration rate of toxic cyanobacteria Microcystis aeruginosa and Cylindrospermopsis raciborskii by Geophagus brasiliensis and Oreochromis sp. that are possible to use as biological control of initial episodes blooms. However it’s necessary an assessment of ecotoxicological effects of cyanobacteria in these cichlids through lipoperoxidation level and activity of antioxidant enzymes. Four experiments were conducted containing two sizes of cichlids (T1 fish 5-10 cm; T2- fish 10-15 cm) and three initial concentrations 10 µg/L, 20 µg/L and 40 µg/L of cyanobacteria cited above, the experiments lasted 96 hours under controlled conditions. To evaluate the effects of these cyanotoxins in these organisms the following biochemical analyses in liver and gills were performed: lipoperoxidation (LPO), evaluating oxidative damage and the activity of antioxidant enzymes catalase (CAT) and glutathione s-transferase (GST). The present study revealed a general pattern that both species of cichlids showed some biochemical changes when subjected to cyanotoxins tested here and in the time and concentrations of experiment does not appear to cause permanent damage, as these appear to have been corrected by antioxidant enzymes. It is necessary studies with larger experiment time of intake/filtration of these cyanobacteria to validate the cichlids as effective biological controls.

RP040. A cytotoxic analysis of atrazine and copper in zebrafish cell lines (ZF-L)
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Freshwater environments are likely to receive contaminants through effluent discharge, and soil leaching due to rain, to quote a few, thus becoming a risk to the aquatic biota. In the surroundings of Lagoa dos Patos (Rio Grande do Sul), the prominent economical activities are agriculture and industry. Following the need for an effective agricultural production, the use of herbicides becomes indispensable. In the growing of corn (the second largest in the state) atrazine is the most used pesticide, so, its effect over aquatic animals deserves attention. Similarly to herbicides, metals can also cause effects to the aquatic fauna. In this lagoon, the presence of copper has already been verified by previous studies. In vitro assays have been aiding in toxicity studies due to their low cost, low residue generation, and quick responses. Therefore, this research aims to verify the cytotoxicity of atrazine and copper in zebrafish hepatocytes, ZF-L cells line. The study consisted in the analysis of 3 concentrations of each contaminant separately, one being the concentration value established by the Brazilian legislation as safe, whilst the other two being, respectively, double and 10 times the allowed value. Regarding atrazine's low solubility in water; methanol was used to prepare the solutions. The results were submitted to an analysis of the dye retention by viable lysosomes. Cells (2.5 x 105 cells/mL) were exposed to different treatments for 6 hours, in 3 - 8 independent experiments. After the experimental treatment, cells were incubated in neutral red (3h), fixed, and the dye was extracted by an acid-alcohol solution and then read at 540nm. Afterwards, the results were submitted to a one-way ANOVA. While the copper was not cytotoxic in the tested concentrations (p=0.0545), the atrazine concentrations of 4 and 20 µg/L-1 were toxic (p=0.0119), thus lowering cellular viability in 20%. Our results with zebrafish hepatocytes indicate that the concentrations established by Brazilian legislation to both atrazine and copper are safe. The atrazine concentration, however, was close to the cytotoxicity level.

RP041. A model to assess apoptotic induction in zebrafish during embryo development caused by chemicals in the water.
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There are more than 90 chemical substances in the drinking water, pointed by WHO as pollutants. Those contaminants are harmful to the wellness and health of human population with different severity degrees. The effects of these pollutants can be studied using zebrafish (Danio rerio) because this species has embryos with external development that depends directly on water quality. This characteristic makes zebrafish a great indicator of water quality. These fishes are being used since the fall of 1997 when the scientific community asked to include the species as a model organism for scientific research. It was pointed, twelve years ago, that the zebrafish embryo is a good model to assess particle-bound pollutants found even in soil sediments. How may the water pollutants cause harmful effects during the embryo development?. Which are the adverse biological effects that are being produced by pollutants? Which are the consequences of the pollution, for the biological diversity and the ecosystem?.

These are some of the questions that may be answered by means of the use of the zebrafish embryo. The main objective of this work is to determine if there is a modification in the rate of apoptosis and proliferation caused by pollutants found in water. We analyzed the zebrafish husbandry and management in laboratory. Several parameters were determined on the well being of zebrafish: behavior patterns, effect of temperature, illumination, alimentation and tricaine concentration. The adult fish are able to resist a wide range of ambient conditions. However the number of gametes and fish embryos produced was low, and probably, it was caused by suboptimal conditions (the light cycle, the temperature and the noise level). We will have to achieve an important improvement on ambient conditions to be able to increase the production of embryos for the advance with toxicological testing.

RP042. Antimutagenic activity and anti-phytotoxicity of Resveratrol in Allium cepa
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Resveratrol is a phytoalexin produced by several plants as eucalyptus, peanuts, blackberry and mainly is present in grapes (Vitis vinifera and Vitis labrusca). In this grape phytoalexin is synthesized in the bark in response to stress caused by fungal attack (Botrytis cinerea, vitula Plasmopora), mechanical damage or by irradiation of ultraviolet light. Resveratrol various actions are known, including anti-inflammatory activity, explained by the inhibition of the activity of cyclooxygenase (COX-1 and COX-2), and the antioxidant activity by inhibiting lipooxygenase dioxygenase. Acts protectively to the development of cancer, for example by inhibiting Quinase protein, a key mediator in the promotion of tumors, an action that could explain their chemopreventive effect. This study was evaluated, through the test with Allium cepa, the protective potential of antimutagenic compound resveratrol front trifuralin admittedly mutagenic substance. We used a 0,84gpm Trifuralin solution mixed with resveratrol at various concentrations (0.5%, 1.0% and 2.0%). Tests were performed in triplicates. The germination index had increased in proportion to the values Resveratrol concentrations. Similarly the production of MN by trifuralin and chromosomal aberrations showed a significant reduction in the presence of resveratrol, showing the protective effect of compound.

RP043. Application of an environmental impact matrix and PEC/PNEC to evaluate the aquatic ecotoxicity of cosmetics raw materials
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The concern of cosmetic industries about supply chain, sustainability and biodiversity ingredient's increases the need to ensure the lowest environmental impact (EI) of finished goods. Whereas few studies are published on ecotoxicity of cosmetics' raw materials, the aim of this work was to propose a raw material analysis tool with relevant internationally recommended parameters database. For the development of the analysis tool it was required a prior assessment of raw materials against ecological and nonecological functions on three different levels: Bioaccumulation; Acute Aquatic Toxicity and Biodegradation. Aiming to quantify the environmental risk, this research proposes two methods for this evaluation: 1) the calculation of PEC/PNEC (Predicted Environmental Concentration (PEC) and Predicted No Effect Concentration (PNEC), which is the risk quotient that evaluates environmental exposure and the aquatic toxicity and 2) the use of an EI evaluation tool, based on the Leopold Matrix, which allows the quantitative and qualitative evaluation of each raw material and also the final formulation. Numerical values were assigned to each raw material related to biodegradation, bioaccumulation and aquatic toxicity parameters and the sum of the parameters results in a final EI value that are in agreement with the classifications of Environmental Protection Agency (EPA) and Regulation (EC) No 1272/2008. The results obtained showed that it is possible to compare cosmetic formulations and raw materials choosing the one with the lowest risk and EI. Two formulations were compared by raw materials class replacement to evaluate the risk assessment and EI. The replacement of Mineral Oil by Glycerin showed an EI reduction from 11 to 1 and PEC/PNEC from 0.006 to 0.003; Cocamidopropyl Betaine by Decyl Glucoside the EI reduction was from 4 to 2 and PEC/PNEC from 0.1141000 to 0.0001924; Benzyl alcohol by Phenoxyethanol the EI was reduced from 3 to 1 and PEC/PNEC from 0.0000022 to 0.00000021; Octyldodecanol by Hexylene glycol with EI reduction from 10 to 0 and the PEC/PNEC from 0.0001046 to 0.0000079. Thus it was showed that there was a significant impact reduction and also environmental risk related to raw materials and consequently the final product. This work showed that through these analysis it is possible to select more sustainable raw materials and develop cosmetics with low impact.

RP046. As/P relationship in Pampean streams: in situ experiments and periphyton colonizations

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In small fluvial systems, biogeochemical processes are attributed largely to periphyton as these communities contribute in its selfpurification, capturing nutrients and accumulating or transforming many pollutants. However, the response of aquatic organisms to arsenic, a metalloid present in Pampean streams, can also have multifunctional functions. This is due to the chemical similarity between arsenate (AsO4³⁻) and phosphate (PO4³⁻). Some studies claim that As uptake produces irreversible damage to the P transport system of cells. In other cases, there is a competition for uptake. This damage could affect P uptake of algae and therefore its ability to deurate the surrounding environment. However, higher affinity of cells to P reduces the impact of As in the presence of nutrient excess. Following the observations made at organism level, interaction between P and As given at ecosystem scale or it becomes obscured by the action of other interacting processes are attributed largely to downstream processes. Field experiments provide results that integrate ecological realism and inferences. But discriminating between inferences made at organism level, interaction between P and As given at ecosystem scales would be expected. Ecotoxicological studies are enriched when they cover the widest range of organization levels, because each level allows a different kind of inferences. But discriminating between environmental variability and the pressure of a contaminant on the biota is very complex. Field experiments provide results that integrate ecological realism and the effect of a contaminant in interaction with other natural factors that also act on organisms. Therefore, the aim of this study was to evaluate whether the effect of P and As interaction on the structure and function of periphyton can be detected at ecosystem scale or it becomes obscured by the action of other interacting factors. Nutrient addition experiments, open metabolism and photosynthetic parameters measurement were performed at reach scale and also periphyton colonization was performed in situ and then transported to the laboratory for in vitro dose-response tests. Experiments and colonization were conducted in Pampean streams with different levels of As and P, providing natural treatments. It was noted that periphytic communities were very P retentive. Also, As produced toxicity on the periphytic community, both functionally and structurally, affecting photosynthetic parameters. It was also observed that the presence of As had an effect on the retention of P in microcosm, which was not detected at ecosystem level, as nutrient retention parameters did not follow a pattern associated with As levels and metabolism associated with P levels, regardless of the levels of As.

RP045. Azoxystrobin short-time exposure effects on photosynthetic parameters in Biddens laevis L.

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Strobilurin fungicides (SF) inhibit mitochondrial respiration in fungi by blocking electron transfer. In plants, SF appear to increase chlorophyll content (Chl) and delay senescence, possibly through induction of cytokinin synthesis and enhanced antioxidant capacity. However, other evidence suggest that shortly after exposure to SF plants may be stressed, as revealed by decrease in chlorophyll a/d (Ca/D) and decrease in chloroplast. The aim of this work was to evaluate the effect of azoxystrobin (AZX) on photosynthetic and antioxidant biomarkers in the hydrophile Biddens laevis L. shortly after exposure to the fungicide. Seeds of B. laevis were collected in La Brava Lake, Argentina, in May 2012. Seeds were sterilized and placed in Petri dishes for germination. Seedlings were maintained in a greenhouse in soil pots for growth. Two plant sets (36 plants each) were exposed at different concentrations of AZX; one set of young adult plants (YP) and other set of pre-senescence plants (PSP). Plant roots were rinsed in water and immersed during 24 h in flasks containing 330 mL of a treatment solution: 0, 0.1, 0.3, 0.5, 100 and 1000 µg/L AZX (n=6). The Chl was measured by chemical extraction and Ca/D was measured by the ratio Fv/Fm (quantum yield of PSII). The activities of enzymatic antioxidant as Glutation-S-Transferase (GST), catalase (CAT) and peroxidase (POD) were determined in PSP root extracts following standard protocols. Chl content was unchanged with different AZX treatments in YP (p value = 0.2075), but a statistically significant decrease in Chl in PSP exposed from 1 to 10 µg/L AZX was observed (p value = 0.0001). The ratio Fv/Fm did not show significant changes at any treatments in YP and PSP. The enzymatic activity of GST, CAT and POD did not show statistically significant changes at any treatments (p value > 0.05), but a trend to higher activities with increasing AZX concentration was found. Early effects of AZX in B. laevis included a decrease in Chl concentration in PSP, while no significant effects on Fv/Fm were found in either YAP or PSP. In PSP roots, the enzymatic antioxidant activity showed an increasing trend. Due to their rather low Log Kow value (2.5), AZX has a high translocation potential from root to leaves. Thus AZX could induce a rapid antioxidant response in root and effects on leaves, which may depend on the plant physiological status.

RP047. Biochemical biomarkers in gills of oyster Crassostrea brasiliana exposed to water potentially contaminated by domestic sewage

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The urban sprawl is an emerging threat to water resources. The native oyster Crassostrea brasiliana is an important sentinel organism in environmental monitoring, and, in addiction, presents great potential for the Brazilian oyster farming. Thereby, the aim of this study was evaluated biochemical responses in oysters C. brasiliana exposed to water potentially contaminated by domestic sewage collected in Camboriú Bay, SC. Water samples were collected in Taquarinhãs (TAQ: reference field), Orange (LAR: aquaculture area), bar (BAR: aquaculture area), river Camboriú (CAM: potentially polluted) and Marambaa channel (MAR: potentially polluted). As control filtered seawater was used (CT: 5 um, sand, UV) collected in the laboratory of marine shrimp (LCM, UFSC). After salinity correction, oysters were exposed for 24 hours and had their gills collected (n = 10) for enzyme activity assays (CAT, SOD, GR, GPx, GST and G6PDH). Microbiological water analyses showed values above those permitted by law for total and fecal coliforms in potentially polluted sites and higher concentrations of phosphorus and total nitrogen on site CAM. The oysters exposed in TAQ and LAR water samples showed lower SOD activity in relation to CT, which suggests possible changes in antioxidant defense capacity. The activity of GR was higher in oysters exposed to samples of BAR and CAM and decreased in control and PSP, which could suggest metabolic changes in intracellular redox balance. The G6PDH activity was greater in animals exposed to water CAM compared to CT, suggesting an adaptive increase.
in production of NADPH to regenerate reduced glutathione and maintenance of the catalytic cycle of CYP450. No statistical differences were observed in the activity of enzymes CAT, GPx and GST. Based on data presented, it is possible to suggest that the water collected sites are effluent receivers capable of causing biochemical changes in the antioxidant defense system in gills of Crassostrea brasiliana. Studies in situ using other biomarkers and different periods of exposure may assist in the evaluation of contamination in the area. Support: INCT-TA.

RP048. Biochemical effects and multi xenobiotic defense systems in Nile tilapia (O. niloticus) after exposure of Diuron, its metabolites and alkylphenyls

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Aquatic organisms are constantly exposed to complex mixtures of compounds and diuron is one of the most commonly used herbicide in sugarcane cultivation. The risks that this compound represents for aquatic organisms close to sugarcane crops are tough not well understood. Diuron can be biodegraded in metabolites such as dichloroaniline (DCA), dichlorophenyl-urea (DCPU) and dichlorophenyl-methyl-urea (DCPMU) that could represent a risk to exposed biota. Diuron, in commercial formulation, generally present adjuvants that could further alter your effects in fishes, but these aspects were not studied yet in these organisms. Considering the use of diuron in sugarcane cultivation in Brazil and the potential risks that this compound and its derived metabolites and adjuvants could pose to fish, in this work we measured a series of biochemical parameters in liver and gills of Nile tilapia, in order to evaluate the negative effects that these compounds in fish, in two tests, using environmentally relevant concentrations. First fish were exposed for 7 days to diuron, DCA, DCPU and DCPMU individually as well as the mixture of the metabolites and mixture with nonylphenol (NP) and octylphenol (OP) in two different concentrations, 40 and 200 mg/L. After this exposure, we collected the tissue of the fish and measured catalytic, superoxide dismutase, glutathione peroxidase, glutathione reductase, glutathione S-transferase and Glutathione-6-phosphate dehydrogenase. Second, we did an in vitro to test the inhibition of multi xenobiotic resistance (MXR) transporters by Diuron and its metabolites, using Rhodamine B to analyze the cellular MXR. We used two different concentrations of Diuron and its metabolites, using Rhodamine B to analyze the cellular MXR. Mixtures of Diuron with its metabolites caused slight differences in biomarkers responses compared to the effect of isolated compounds and stronger effect was observed for mixtures with OP and NP. Taken together, our results showed that diuron and its biodegradation metabolites are prone to alter antioxidant defense systems, biotransformation enzymes and elimination of compounds (MXR). Mixtures of Diuron with its metabolites caused slight differences in biomarkers responses compared to the effect of isolated compounds and stronger effect was observed for mixtures with OP and NP. Taken together, our results clearly demonstrated that diuron or its biodegradation metabolites, at concentrations found in aquatic environments, could impair the metabolism of fish, especially in the presence of alkylphenols, indicating that can represent a risk for aquatic biota.

RP049. Biochemical responses in digestive gland of oysters Crassostrea brasiliana exposed in laboratory to water potentially contaminated by sanitary sewage

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High loads of anthropogenic contaminants are found to be discharged into Brazilian marine ecosystems. Balneario Camboriú (Brazil) is one of the most densely populated cities on Brazilian southern coast and a major tourist destination as well. Both facts may threat local growing mariculture activities. To investigate a potential scenario of aquatic contamination, which may possibly affect bivalve health and production, this study evaluated biochemical responses in the digestive gland of Crassostrea brasiliana exposed in laboratory to water from Camboriú Bay. Water quality was analyzed in five sites: CAM (mouth of Camboriú river – urban area); MAR (Marambaia channel – urban area); BAR (Barra – aquaculture area close to CAM); LAR (Laranjeiras – aquaculture area); TAQ (Taquarillas – clean site). Oysters were obtained from a mariculture laboratory (LMM) from Federal University of Santa Catarina (Florianópolis, Brazil) and acclimated for 11 days. Later, animals were exposed for 24 h in laboratory either to water collected in situ at Camboriú Bay (5 sites), or alternatively, to filtered sea water collected at another aquaculture facility from LMM (reference 2). Microbiological analysis of water samples indicated coliform levels above the legislation limits (MAR 181 x, CAM 27 x) and LCM (2 x), whereas levels could be accounted to sewage discharge at CAM (170 x) and MAR (16 x higher than legislation). Higher GST or CAT activity, as well as lower SOD activity, were detected in sites under intense urban pressure (MAR and CAM). In addition, an aquaculture area (BAR) presented higher GST or CAT activity when compared to reference (LCM or TAQ). No statistical differences were detected for other enzymes analyzed. Biochemical data suggest slight disturbances on the antioxidant and biotransformation system, possibly related to organic contaminants from sanitary sewage. Together with the microbiology assays, data point to the negative effects of sanitary sewage discharged at Camboriú Bay, with special attention to urban (CAM and MAR) areas as well as to those with aquaculture activities. Additional studies are necessary to better characterize the anthropogenic pressure in this important bay.

RP050. Biomarcadores convencionales y exploración de nuevos parámetros en Mytilus quinque starta expuesto al fungicida Amistar®

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Los fungicidas estrobilurínicos se han comercializado massivamente desde la década de 1990. La AZX actualmente es aplicada en más de 100 cultivos diferentes, si bien se conoce el mecanismo de toxicidad para hongos, y existen algunos datos sobre sus efectos en fauna marina, no hay información sobre sus efectos en especies vegetales no- blancos. Las macrofitas acuáticas han sido empleadas como biomonitoros ya que tienen la capacidad de responder a la presencia de xenobióticos en concentraciones menores que las necesaria para generar una respuesta en animales. Los biomarcadores más utilizados son los bioquímicos, en particular actividades de enzimas involucradas en el estrés oxidativo. Cuando los mecanismos de acción son desconocidos para organismos no-blancos es importante evaluar la actividad de enzimas implicadas en otros procesos, como es el caso de enzimas glicoximolásicas, como isocitrato liasa (ICL) y glicolato oxidasa (GOX). El objetivo de este estudio fue establecer curvas de concentración-respuesta en Mytilus quinquestarta expuesta a fungicida AMISTAR®, para enzimas tanto de estrés oxidativo convencionales como no convencionales. Como parámetros de estrés oxidativo convencionales se analizaran: Guanacol Peroxidasa (POD), Glutatión-S-Transferasa (GST) y Catalasa (CAT), y dentro de los no convencionales: ICL y GOX. Las plantas fueron expuestas a 10, 50 y 100 mg/L respecto del control (p< 0,05). Las actividades enzimáticas fueron evaluadas por medio de espectrofotometría. Se observó la inhibición de la actividad enzimática de POD en plantas expuestas a 10, 50 y 100 mg/L respecto del control (p< 0,05). GST y GOX mostraron una inducción en la actividad enzimática, en el caso de GST a concentraciones de 0,1 y 1 mg/L respecto del control, y GOX a 50 mg/L (p< 0,05). No se observó una alteración en el proceso metabólico de fijación de carbono, con la consecuente producción de H2O2; si bien esto no se tradujo en un cambio de CAT respecto al control. Por otra parte, la ICL no mostró diferencias significativas en ninguno de los tratamientos. Estos resultados muestran la importancia de utilizar una biomarcador, debido a sus sensibilidades diferentes, para evaluar los efectos negativos potenciales de contaminantes emergentes en el medio ambiente.

RP051. Characterization of genotoxic effects as a tool for water quality monitoring of small tropical watersheds

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Diverse ecotoxicological approaches can be investigated in order to select the most applicable for water quality biomonitoring in conservation or restoration programs. The aim of this study was to investigate the genotoxic effect (comet assay) as one of these possibilities. Thus, water samples were collected at a small tropical watershed in Minas Gerais State (RP051), a total of 10 samples were collected at 4 different sites with different anthropogenic uses (PO-control – used as water supply for human consumption), (P1) – cattle pasture, P2-agriculture and P3– urban area. Physical and chemical analyses were conducted for each sampling site, including chemical oxygen demand (COD), phosphorus (P), carbon organic total (TOC), nitrate, suspended material, electrical conductivity and metals. Experiments were carried out in laboratory, in which 5 juveniles of Danio rerio were exposed to
each water sample. After 48h, 72h and 10 days, samples of blood gills were collected for estimation of DNA damages according to Lenos et al. (2004) and TICE et al. (2000) with modifications. Genotoxic effects were observed in the erythrocytes of fish exposed to water samples from the P2- (agriculture sample) site at 48h time exposure, but after 72h and 10days exposure, the damage was recovery. These data were confirmed by Dunnet’s test (p<0.05). It was also observed decreases of bacteria, COD, electrical conductivity, coliforms bacterial and suspended material values at site P4 (urban area). The results emphasize the need of improving monitoring tools in waters bodies, in order to reduce ecosystem risks to contaminants. Among such tools, genotoxic effects could be included. Keywords: biomonitoring, fish, comet assay.

**RP052. Cytogenetic and molecular evaluations of an industrial effluent in southern Nigeria on Allium cepa roots**

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Several industries in Nigeria have been implicated in indiscriminate discharge of effluents into surrounding water bodies. In this study effluents from a glass manufacturing industry in southern Nigeria were collected at the point of discharge to assess the toxicity and their potential impact on the receiving water body. The effluents were analysed for physicochemical parameters and cyto-genotoxicity evaluation using the Allium cepa test. The random amplified polymorphic DNA (RAPD) assay was used to assess the level of DNA damage in root tip meristems of A. cepa L. cultivated in the effluent samples. Results of the physicochemical analysis showed that most of the parameters of the wastewater were present at amounts within limits set by national (NESREA) and international (USEPA) for effluent discharge. However, compared with the control, results obtained from the cyto-genotoxicity studies showed significant concentration-dependent reduction of mitotic index and induction of chromosomal aberrations at all tested concentrations. DNA polymorphism was discernable by changes in the RAPD profiles as variation in the intensity, disappearance of old and appearance of new bands compared to the control. A total of 171 bands were detected and 96 (56.14%) of these fragments were polymorphic. The loss and gain of bands increased with concentration of the effluent. The data obtained from this investigation suggests that the system of waste management of this effluent is inefficient to guarantee minimal risks associated with its discharge into the environment.

**RP053. Decoloración y detoxificación del colorante trifenilmetánico verde de malaquita mediante hongos de pudrición blanca**

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Los derivados de tri fenil metano son una de las clases más antiguas de colorantes sintéticos. Tienen una coloración azul brillante e intensa, son baratos y se aplican en gran escala en industriales y el elevado costo de los tratamientos físico químicos hacen necesario buscar alternativas viables para minimizar el impacto de estos contaminantes. Los hongos de la pudrición blanca (WRF) poseen enzimas liginolíticas capaces de degradar anillos aromáticos presentes en la lignina, así como también de otros compuestos aromáticos, como el caso de muchos colorantes. Phanerochaete chrysosporium, un hongo modelo de la pudrición blanca, es un WRF que posee la maquinaria enzimática para degradar la lignina, sin embargo exhibe una muy baja tolerancia al VM. Se realizaron los experimentos de degradación en extracto de maíz agarizado (MEA), suplementado con una concentración de VM de 10 mg/L, para el P. chrysosporum. Se utilizaron los WRF: Cornus antarcticus, Trametes versicolor, Trametes trogii, Ganoderma lucidum y Phanerochaete chrysosporium, con el uso de un medio de cultivo reconstituido con MEA medio agotado libre de micelio en una proporción 1:1. Este medio reformulado fue autoclavado y plaquedado, inculando con P. chrysosporum (sensible al VM). Como control de toxicidad negativo se utilizaron medios reconstituidos a partir de MEA con cada organismo crecido y luego filtrado/MEA virgen, y como control positivo MEA-VM/MEA virgen. En todos los casos donde se produjo la decoloración, P. chrysosporum creció tanto en los medios decolorados reconstituidos como en los medios agotados sin VM reconstituidos, mientras que en los medios VM reconstituidos, la inhibición del crecimiento de P. chrysosporum fue total.

**RP054. Determinación da capacidade antioxidante de diferentes cepas de Caenorhabditis elegans em três temperaturas de ensaio (22, 27 e 37°C).**

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O Caenorhabditis elegans é um nematóde, não parasita, de vida livre, que se encontra por todo o globo terrestre, sendo este um organismo muito estudado desde a década de 70 na mais diversas Brees como: biologia celular, bioquímica e toxicologia. Isto se deve ao curto ciclo de vida tipico (28 dias), fCél cultiv e manipulAc, tamanho reduzido (A 1.5mm de comprimento), 80 som de di metro nos adultos), conhecimento do numero total de cf julas, genoma sequenciado alBm de nB necessario de aprovAc pelos comitês de jftca e uso animal. Devido hB estas facilidades C possBvel realizaã do teste bioAgólicos com certa rapidez quando comparados a outros animais. Sendo esta uma importante ferramenta para compreender os processos mecanisticos nos quais agentes tico podem afetar organismo ou determinada via de detoxificaã o. O objetivo deste estudo foi avaliar a capacidade de defesa antioxidante total de diferentes cepas de C.elegans frente a radicais peroxil em Trs temperaturas (22, 27 e 37C). Os C. elegans foram cultivados em meio de cultura NGM (Nematode Growth Medium) mantidos a 22C, sendo estes alimentados com bacftrias Escherichia coli OP50 durante 96 horas. Após os animais foram transferidos para placas contendo meio 8P e contendo bactfrias NA22 durante 72 horas a 22C af serem removidos das placas e homogeneizados para posteriores anBlise da capacidade antioxidante.Neste trabalho observamos que a cepa N2 (Selvagem), apresentou um reduzida capacidade antioxidante nas temperaturas 22 e 27BC, no entanto no ensaio a 37C a cepa N2 apresentou uma melhor capacidade antioxidante nas trfx concentrAes de proteAina utilizadas. Al mo do mais se observou que na temperatura de 37C as cepas que apresentavam genes knockouts para as enzimas antioxidantes apresentaram menor capacidade antioxidante (GA480 - supFertido desmutase; VC754 - catalase) , demonstrando que a deficiência destas enzimas afeta a capacidade antioxidante do organismo.

**RP055. Determinación de aberraciones cromosómicas en especímenes de Prochilodus lineatus (Pisces) expuestos al herbicida glifosato**

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La agricultura intensiva tiene como principal propósito el aumento de la productividad por hectárea, pero para lograr dicho objetivo es necesario el control de plagas y malezas, esto trajo aparejado un crecimiento exponencial del uso de plaguicidas. Estos son vertidos a las cuencas hídricas provocando contaminación del agua e impactando así en el ambiente. El objetivo de este trabajo fue evaluar los efectos genotóxicos del Glicosato a través del ensayo de Aberraciones Cromosómicas (AC). La especie utilizada fue Prochilodus lineatus (sábalo). En el bioensayo se emplearon dos grupos control y tratado. Los acuarios pertenecientes al grupo control recibieron solo agua de pozo artesiano, a los del segundo grupo además del agua se les administró 0,1ug/L de herbicida. Finalizado el tratamiento (70 días) los peces fueron sacrificados con MS222. Se extrajo el riñon cefálico para la obtención de los cromosomas mitóticos según la técnica de Foresti et al. (1993). Se observaron 50 metafases por individuo. El análisis cromosómico del grupo tratado reveló la presencia de las siguientes AC: gaps, fracturas, adhesividad, endomítosis, fragmentaciones y pulverizaciones. De este modo, los resultados sugieren la existencia de una respuesta genética ante el contacto con el plaguicida.

**RP056. Effect of glyphosate acid on periphyton exposed in outdoor microcosms**

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Nowadays, the agricultural technologies are associated with intensive and sustained use of agrochemicals. The runoff and aerial drift phenomena put the water bodies bordering agricultural lands in a vulnerable situation, by determining the entry of herbicides that impact their communities. Periphyton is a complex aquatic microbial community with many attributes that makes it a useful early biomonitor of pollution. The outdoor microcosms are important models, because they allow mimic the effect on natural communities. In this study the effects of glyphosate acid (GlpA) on the growth and metabolism of periphyton exposed to 0, 1, 3 and 6 mg GlpA/l with and without bivalves (Limpoperna fortunei) presence were evaluated. The experiment was carried out on outdoors microcosms. The experimental design aimed to recreate the impact of a time period of exposure to GlpA (26 days) similar to the elapsed time between two applications of the pesticide in an agricultural scheme. The impact of GlpA on biomass, carotene/chlorophyll a ratio and oxidative stress parameters was evaluated at 1, 7, 14 and 26 days of exposure. In microcosms without bivalves, it was observed an increase of total biomass of periphyton (ashfree dry weight) with 1 mg GlpA/l at day 26 (probably hormesis effect) and a diminution with 6 mg/l at 26 day (inhibitory effect). However, a differential effect on autotrophic biomass was occurred, evidenced by an increase of chlorophyll a/c2m with all GlpA concentrations at days 7, 14 and 26. The carotene/chlorophyll a ratio showed significant diminutions respect to the controls with all GlpA concentrations at 26 days of exposure. These results indicated indication of alteration in the structure of the photosystems in periphytic algae. The lipid peroxidation levels showed a significant increase respect to the controls in periphyton exposed to 1, 3 and 6 mg/l at day 7. The antioxidant enzymes catalase and superoxide dismutase showed activities significant lower than the controls with all GlpA concentrations at days 7, 14 and 26 days. Results indicates alterations in oxidative stress parameters, wich could indicate their participation in the effect exerted on the whole periphytic community (heterotrophic and autotrophic fractions). In microcosms with bivalves, all the effects were ameliorated, observing values similar to the controls for all parameters analyzed. This could lead to the fall of glyphosate by filtering activity of bivalve.

RP057. Effects of glutathione depletion in a marine bivalve

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Glutathione (GSH) is an antioxidant found at considerable concentrations inside cells (1-10 mM) that acts conjuntly with enzymes in the elimination of reactive oxygen species (ROS) and conjugation to electrophilic compounds. Many environmental contaminants are known to induce ROS production and/or depend on GSH conjugation for detoxification. Many ecotoxicological studies determine GSH levels as an oxidative stress biomarker, however little is known about the real consequences of GSH depletion in commonly used sentinel organisms, such as bivalves. The objective of this study is to understand the importance of GSH for hemocyte function. Pacific oysters (Crassostrea gigas) were injected with buthionine sulfoxime (BSO) 5 or 15 μmol in the adductor muscle. BSO is a known inhibitor of glutamate-cysteine ligase, the rate-limiting enzyme responsible for GSH synthesis. Total GSH content (GSH + GSSG) was measured in gill, digestive gland and hemocytes after 0, 1, 2, 3 or 6 days and compared to vehicle (sterile seawater) injected control animals. GSH levels significantly decreased (30-40%) after 3 and 6 days in gill and digestive gland with both BSO doses. In hemocytes, decreased GSH levels (34%) were observed only after 3 days with the 5 μmol dose. This treatment was thus used to study hemocyte viability (neutral red and MTT assays), ROS production (NBT assay) and adhesion. Interestingly, low levels of GSH did not jeopardize any of the hemocyte immune function analyzed. Moreover, after the same BSO treatment, hemocytes were furtherly in vitro exposed to an electrolytic and cytotoxic agent (CDNB) for 1h, and viability was evaluated (neutral red assay). Similarly, the lower content of GSH did not increase CDNB toxicity in hemocytes. These results indicate that a 30-40% depletion of GSH does not compromise hemocyte function in Pacific oysters. Nevertheless, this study could investigate the toxicity of substances dissolved in water. The aim of this study was to test the toxicity of water from a tributary of Bermejo River and elutriates from soil contaminated with residues from an abandoned gold mine on Daphnia magna. Nine sampling sites in the town of La Planta (Marayes) were taken in summer (march): 3 samples of water on the riverbed of a tributary of the Bermejo River (3 km upstream, La Planta height, and 3 km downstream) and 6 samples of the first 20 cm of soil: 4 sites on the riverbed and 2 in the riparian zone. The experiments were conducted in microcosms with bivalve, earthworms and seeds of lettuce, germinated for 24 hours. The toxicity test with Site 2 were: root elongation (14.95%) > hypocotyl elongation (15.54%) > seed germination (26.27%); whereas in toxicity test with Site 3 were: seed germination (14.04%) > hypocotyl elongation (22.11%) > root elongation (16.62%). The G50% concentration in Site 2 (10.41%) was higher than in Site 3 (2.94%), which was affected by the seed germination. Regarding earthworms, LC50 in Site 2 (10.00%) was higher than in Site 3 (3.53%). Lethal effects were observed on earthworms and seeds (necrotic seeds) from 15% and 40% respectively. Site 3 showed higher toxicity than Site 2, although no significant statistical differences were found. Physicochemical parameters of the contaminated soil indicate a high bioavailability of metals due to the low pH and high salinity. Changes in the values of these parameters could be associated to the intensity of effects observed on survival and growth of the studied organisms.

RP058. Effects of soils contaminated with residues of an abandoned gold mine in Marayes (San Juan, Argentina) on Daphnia magna

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Mining activities may generate environmental impact due to unplanned disposal of residues. Contaminated soils can affect the survival and growth of terrestrial organisms. The aim of this study was to evaluate the effects of soils contaminated with residues of an abandoned gold mine on lettuce (L. sativa) and earthworms (E. fetida). Three sampling sites were taken from the first 20 cm soil in La Planta town (Marayes): A soil contaminated with mining residues (Site 1) and two soils located 2 Km upstream (Site 2) and 2 Km downstream (Site 3) respect to Site 1. Soils were characterized through physicochemical determinations including metals. Toxicity tests were conducted for each organism and control group (Sites 2 and 3). The experimental design consisted of 8 treatments in the range of 5 to 100% and a control group for earthworms (3 replicates) and lettuce (10 replicates). Treatments were made from mixture of Site 1 and control groups (dw/dw). Petri dishes containing 25 g of soil and 10 seeds of lettuce were kept in darkness and 22±1°C for 120 h. Plastic vessel with 400 g and 8 adult earthworms were placed under indirect light (16LD) and 24±2°C for 14 days. The endpoints were: number of germinated seeds, length of root and hypocotyl and number of living earthworms. IC50/LC50, NOEC, LOEC, ROE and EI were estimated. Soil 1 was characterized by an acid pH (2.3) and high conductivity (41 mS/cm). Metals (As, Zn, Bi, Mn, Pb, Cu and Fe) were more concentrated in Site 1 related to Sites 2 and 3. The IC50 sensitivity in toxicity test with Site 2 were: rootelongation (14.95%) > hypocotyl elongation (15.54%) > seed germination (26.27%); whereas in toxicity test with Site 3 were: seed germination (14.04%) > hypocotyl elongation (22.11%) > root elongation (16.62%). The G50% concentration in Site 2 (10.41%) was higher than in Site 3 (2.94%), which was affected by the seed germination. Regarding earthworms, LC50 in Site 2 (10.00%) was higher than in Site 3 (3.53%). Lethal effects were observed on earthworms and seeds (necrotic seeds) from 15% and 40% respectively. Site 3 showed higher toxicity than Site 2, although no significant statistical differences were found. Physicochemical parameters of the contaminated soil indicate a high bioavailability of metals due to the low pH and high salinity. Changes in the values of these parameters could be associated to the intensity of effects observed on survival and growth of the studied organisms.
contamination plume, spaced every 700 m. (Sites 1, 2, 3 and 4), and two reference sites (2 km upstream and 2 km downstream from the Site 1). Water samples and elutriates were characterized by physicochemical determinations. Acute toxicity tests were carried out using D. magna, according to a standard protocol. Experimental design consisted of 7 treatments by triplicate: six concentrations of each sample in the range of 0.01 to 100% and a control group. Ten neonates were exposed to 30 mL of sampling or control water in glass vessel for 48 h under controlled conditions (photoperiod 16L:8D; 21 ± 2°C). Number of immobile neonates was registered as endpoint. The contamination plume observed in the environment was characterized by a variation in color of soil and density of vegetation. No toxicity was observed in the samples of water (pH = 8.17 ± 0.30; electrical conductivity = 630 ± 1134 mS/cm) nor in elutriates of the reference sites (pH = 8.37 ± 0.38; electrical conductivity = 558 ± 510 mS/cm). A decrease by 68% in the toxicity was observed between Site 1 (ECSO = 0.05%; NOEC = 0.01%; LOEC = 0.08%), point with mining residues, and Site 4 (ECSO = 68.35%; NOEC = 1%; LOEC = 25%), located to 2100 m from Site 1. Toxicity was associated with the decrease in electrical conductivity (4120 to 233 mS/cm) and concentration of heavy metals (As, Bi, Cu, Zn, Pb, Co, Mn, Fe), and the increase in pH (2.86 to 4.76) across from the contamination plume. Results suggest that the changes in these parameters were related to the soluble elements from mining residues. However, water quality was no affected by the contamination plume at this sampling time.

RP060. Embryotoxic effects of phenanthrene and linear alkylbenzenes to oyster Crassostrea gigas

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Several contaminants such as polycyclic aromatic hydrocarbons and surfactants are present in sanitary sewage. However, there is incipient knowledge about the effects of these pollutants in the early life stages of aquatic organisms, like bivalves. The aim of this study was to evaluate the toxicity of phenanthrene (PHE) and linear alkylbenzenes (LAB) during the embryo-larval development of the oyster C. gigas. The gametes were collected from adult oysters, separated by screens, fertilized and maintained in the experimental units (100 mL, 100 larvae/mL) during 24 h. Based on preliminary assays, concentrations were set for PHE (0.37; 0.75; 1.5; 3.0 and 6.0 µg/L) and LAB (3.5; 5.3; 8.0, 12.0 and 18.0 µg/L). As positive control, larvae were exposed to sodium dodecyl sulfate (SDS: 320-3200 µg/L). The embryo-larval development assessment were expressed as net percentages of the normal development (NPNE) of D-shaped larvae, the shell heights was used as an indicator of growth and the effective concentration (EC50) was calculated using Trimmed Spearman Karber method. It was observed a survival of 95 ± 3.8% in the control group and EC50-24h was 949, 86 µg/L (848 - 1063 µg/L) in SDS exposed group. The PHE EC50-24h was 1, 91 g/L (1, 57 - 2.31 µg/L) and LAB 8.94 µg/L (7,20 - 11,11 µg/L). After 24h of exposure, the contaminants affected the morphological development. The NPNE showed a significant difference in all concentrations of PHE and LAB compared to control group. The PHE exposure increased larval abnormalities in mantle (44,5 ± 7,4%) and shell (27,9 ± 17,5%). LAB exposure showed an opposite pattern with changes in the shell (38 ± 14,7%) mantle (33 ± 21%). Significant growth inhibition was observed in larvae exposed to PHE (0,75 to 6,0 µg/L) and all LAB concentrations caused significant inhibition effects to the larvae. This is the first study demonstrating the susceptibility of C. gigas embryos to environmental contaminants PHE and LAB.

RP061. Estudos de remediação do sedimento de um reservat

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A Lagoa da Pampulha, um reservatório urbano eutrófico localizado no município de Belo Horizonte, MG-Brasil, vem sendo estudado do ponto de vista limnológico, desde a década de 1980, e ecotoxicológico há aproximadamente 15 anos. Do ponto de vista ecotoxicológico, três anos de estudo para avaliação e identificação da toxicidade (AIT) na água, conduzidos em 2011 e 2012, indicaram compostos orgânicos apolares, compostos fibrilares, além de compostos oxidantes e amônia no primeiro estudo (2011). Para o sedimento (água intersticial), os resultados indicaram amônia tanto em 2011 quanto 2012. Dando continuidade aos estudos com sedimento, amostras foram coletadas na lagoa em dois compartimentos (intermediário e final próximo à barragem), cujos testes preliminares de toxicidade, conduzidos no final de maio de 2014, mostraram efeito crônico do sedimento total e do elutriado em ambos os compartimentos. Os organismos utilizados, que incluíram Ceriodaphnia silvestrii e Chironomus xanthus foram mantidos em água proveniente de uma fonte natural, com valores de dureza entre 30,0 e 35,0 mg.L-1 de CaCO3, condutividade de 112,0 µS/cm e pH 6,5, na qual é feita a correção para pH 7,0. Com base nos resultados obtidos, foi possível demonstrar que elutriados com amostras do sedimento total tratadas com carbvac aviado e zeólitas com especificidade para amônia e metais pesados, os quais representam uma inovação metodológica para estudos em ambientes tropicais, lembrando que é comum a detecção de amônia em tais ambientes. A metodologia adotada seguiu a USEPA (2007) com adaptações, optando-se pela redução de 50% na quantidade dos reagentes utilizados. Os experimentos indicaram presença de matéria orgânica no compartimento final da lagoa e amônia no compartimento intermediário. Por outro lado, o uso de zeólita com especificidade para metais não foi conclusivo. Neste sentido, novo experimento está sendo conduzido tendo como base as mesmas condições de 2014, exceto para metais, com a substituição de zeólita por sulfeto de ferro.

RP062. Evaluation of Caesalpinia ferrea pods toxicity through bioassays with Allium cepa, Eruca sativa and Artemisia salina

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Plants as medicines have been used by human society since ancient times, indicating that this group of live system can provide a production of therapeutic bioactive. However, the used in a popular form and without a standardization of preparation and dose to be administered, one can not rule out possible risks of intoxication. Caesalpinia ferrea is widely used for its effects, having anti-inflammatory, astringent and expectorant action, besides being used as a mouthwash. This work has as objective to characterize the toxicity of C. ferrea pods on germination parameters of Allium cepa and Eruca sativa and mortality of Artemisia salina. Aqueous extract were obtained from fresh pods (100 g/L) by boiling water and incubation for 12 hours. The extract was prepared in concentrations of 100%; 75%, 50% and 25%. For the acute toxicity test was used Artemisia salina microcrustacean whose cysts were incubated until the emergence of nauplius larvae. Ten larvae were exposed to each concentration and verified the death rate after 24 hours, as indicated by the protocol. The extracts toxicity for A. cepa and E. sativa seeds were evaluated in Petri dishes lined with filter paper, containing 10 seeds, and wetted with 3 ml of extract for a period of 72 hours, by using germination percentage, percentage of germination variation, inhibition of germinability rate and radicular growth inhibition rate. All assays were performed in triplicate. The A. salina assay results demonstrated a mortality of 100% in all conditions tested after 24 hours. The C. ferrea pod extracts exhibited effects on all parameters tested. It induced reduction around 80%, 50%, 30% in germination percentage, percentage of germination variation, and inhibition of germinability rate, respectively in E. sativa seeds. The parameter of radicular growth inhibition rate was the most affected. For Allium cepa seeds variations between 80%, 60% and 50%; 100% and 50% were determined for germination percentage, percentage of germination variation, inhibition of germinability rate and radicular growth inhibition rate, respectively. The seeds of E. sativa exhibited a higher sensitivity compared to A. cepa seeds. The toxicity assays results obtained in this study present the effects of C. ferrea pod extracts, and can be tested in others bioassays to generate mare data about this medicine plant.

RP063. Evaluation of DNA damage in Ctenosteron decemmaculatus generated by pesticide runoff from experimental plots of corn, wheat and soy.

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Diffused contamination in rural and surrounding urban environments produced by agrochemicals constitutes an important concern for our society. A global analysis of cause and effect is required, in order to provide essential information.
to take decisions that contribute to the reduction and mitigation of different treatments that affect the environment. The aim of this study was to evaluate the DNA damage caused on the fish Ctenodon decemmaculatus, an extended distributed organism in South America. Bioassays were conducted using limnocorals situated in a superficial natural water system which receives the influence of agricultural production under a recommended system of crop rotation. The evaluation was carried out during four different periods: the first one taking samples without the application of pesticides or rain runoffs; while the other three were tested after the application of agrochemical products and a rain runoff event, covering corn, wheat a soybean crops. Six limnocorals with ten juveniles each were place in the system in a way that allowed the evaluation of different concentration levels, with the possibility to establish later, gradients of runoff effect. We evaluated DNA damage through the comet assay on epithelial gill cells of control and exposed fish. Specimens were taken from the limnocoral at 72 h later probed runoff event towards the lagoon. During these periods water analysis were made, and pH and temperature were determined. The results show statistically significant differences (p < 0.05) on the gill epithelium DNA damage of the individuals exposed to the runoff, compared to the control value previously determined. The results found highlight the need to understand, prevent and correct the environmental conflicts and slow down the deteriorating processes caused by the use of agrochemicals on extensive primary production systems, to contribute to the socio-agro environmental sustainability and recovery.

**RP064. Evaluation of enzyme aldehyde dehydrogenase (ADLH) to access oxidative stress effects in Astyanax sp exposed to biodiesel B5**

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Aquatic environment is generally the final destination of pollutants generated by humans, either through precipitation, runoff or direct discharge. Among the negative effects of pollutants to aquatic animals we can highlight oxidative stress, which can be evidenced by increases in lipid peroxidation in different organs, measured by means of malondialdehyde (MDA) levels. However, although increases in MDA levels have been related to pollutants effects in fish, some studies have shown significant decreases in MDA levels under exposure to different pollutants, which have been usually interpreted as a response of antioxidant stimulation. Although increases in antioxidant defenses can account for diminishing MDA levels, we hypothesize that MDA excess can also stimulate enzymes involved in its metabolism, such as aldehyde dehydrogenase (ADLH), resulting in a rapid decrease in MDA level. Thus, the aim of this study was to evaluate the relationships between MDA levels and ADLH activity in the fish lambari (Astyanax sp) exposed to biodiesel B5. Previous studies in our laboratory showed that depending on the concentration B5 can decrease MDA levels in fish. Thus, fish were exposed for 5 days to B5 at concentrations of 0.001, 0.01 and 0.1 mL L⁻¹; one group was maintained in clear water, as the control group. After the exposure period, the activity of ADLH (spectrophotometric) and MDA levels (HPLC) were measured in the liver. A significant increase in ADLH activity was observed in groups exposed to 0.01 and 0.1 mL L⁻¹ of B5, when compared with the control group. In contrast, it was observed a significant decrease in the MDA levels in these same groups compared with the control. These results indicates that B5 is capable of inducing ADLH in the lambari, accounting for a substantial decrease in MDA levels, indicating the measurement of ADLH as an important complimentary biomarker when studying oxidative stress effects of pollutants in fish.

**RP065. Evaluation of sewage sludge toxic potential, before and after addition of soil and rice hulls**

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Many ecosystems are being impacted by waste from human activities. Among these residues, the sewage sludge (SS), generated at Sewage Treatment Stations (STS), is highly impactful to the environment and has crescent production, related to the increase of population density. The Brazilian production of SS is in about 150 to 220 thousand tons of dry matter/year. As the SS has a high concentration of organic matter and nutrients and a high production, this material can be a resource for mining, without harming the environment as agro-fertilizer that contain hazardous substances to life, as metals and toxic organic substances and, therefore, compromise the ecosystem and human health. Thus, it becomes necessary the development of methods that can reduce the toxicity of SS and allow its safe use and sustainably. The bioremediation, a process that uses the endogenous microbiota of the environment, is capable of modifying or decomposing pollutants. The efficiency of this process can be further improved by the presence of decompressing agents, such as rice hulls. This study evaluated the cytotoxic, genotoxic and mutagenic potentials of SS aqueous extracts obtained from the STS Caríoba (Americana – SP – Brazil), pure and in mixtures with soil and rice hulls, by assays using the test organism Allium cepa. The experiments, performed to evaluate the capacity of bioremediation of the SS and its consequent detoxification, were developed in stainless steel tanks containing, individually, 3 v/v/v samples of the different proportions of SS+soil+rice hulls (3:1:1 v/v/v), maintained for different periods of time (T0 = initial period; T1 = 3 and T2 = 6 months of bioremediation). The results presented herein refer to the initial evaluation of the toxicity of the samples (T0), in other words, performed before the beginning of bioremediation. The data showed that the aqueous extracts of the studied samples did not induce cytotoxic effects (cell death and changes in the mitotic index) nor genotoxic effects (presence of chromosomal and nuclear changes). Regarding the mutagenicity (presence of micronucleus and chromosomal breaks), statistically significant results was observed only for the pure SS sample. From these results, it can be concluded that, before the SS be used in agriculture, it must pass through a detoxification process and that the addition of soil and rice hulls to the SS seems to be suitable for this purpose.

**RP066. Evaluation of survival, growth and reproduction of Hyalella azteca and Ceriodaphnia dubia in formulated sediment**

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Laboratory-formulated sediments have been widely adopted and recommended by environmental protection organizations and other international agencies as U.S. EPA, OECD, and ASTM. The main advantages of laboratory-formulated sediments are easy reproducibility by different laboratories, and being free of unwanted contaminants. However, it is important to note that one of the most important steps to be considered when evaluating sediment formulations representative of tropical lotic environments, regarding survival, growth, and reproduction of benthic and nektic species Hyallela azteca and Ceriodaphnia dubia. Calcined sand (coarse, medium and fine) and sterilized kaolin clay were used to formulate sediment, as well as organic matter, composed by fish food (TetraMin®) and humus (AgroBest®). After sediment conditioning time of 2 days, the organisms were put into sediment-containing recipients. Both tests were conducted according Brazilian standards ABNT NBR 15470/2011 (H. azteca) and ABNT NBR 13373/2010 (C. dubia). Test control for H. azteca was provided by the same sediment formulation without organic matter, whereas for C. dubia only reconstituted water was used since it is a nektic species. Results showed that formulated sediment containing fish food as organic matter had good acceptance by H. azteca, with average dry weight of 0.155 μg and length of 2.30±0.084 mm after the 10-day test, and 8.60±1.52 offspring per couple after the 14-day test. However, this formulation of sediment was not ideal for tests with C. dubia, which presented high levels of mortality and no offspring. Although reconstituted water is commonly used as substrate to extract pore water, the species produced 8.1±3.6 offspring in average. Also, organisms exposed to pore water presented apparent changes in size and color compared to control. However, subsequent tests using whole formulated sediment with humus as organic matter in place of fish food showed satisfactory results for C. dubia (with 25.7±1.26 newborns) and H. azteca (with 14.4±2.55 newborns) in average and 100% survival. We concluded these formulated sediments have promising use in laboratory with mentioned aquatic organisms for future contaminant tests. Testing sediment formulations on interested species before use of contaminants is important, since one or more sediment components may not be suitable to organisms culture.

**RP067. Evaluation of the genotoxic potential of cadaverine in mammal cells by the comet assay**

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The decomposition of bodies is considered a pollution source due to the production of an organic liquid called necroslurry, which besides compromising the environment, can cause serious problems to human health. In the composition of this liquid, there is the amine cadaverine (CSH14N2), a highly toxic substance, produced during the putrefaction of organic tissues in bodies in decomposition. No studies are not studies that evaluate the genotoxic potential of this diamine. Thereby, the aim of this study was to evaluate the genotoxic potential of different concentrations of the diamine cadaverine (307.5 mg/L, 184.5 mg/L and 61.5 mg/L) using the comet assay in human hepatoma cells (HepG2), maintained in culture. Sterile PBS solution was used as negative control and sterile MMS aqueous solution (4x10⁻⁴M) as positive control. The cells were cultivated in MEM medium supplemented with 10% fetal bovine serum and kept

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at controlled temperature (37°C) in 5% CO2. Cells were exposed in the established concentrations for 24 hours. After exposure, cells were collected to carry out the cell viability test with Trypan Blue, and the comet assay. 900 nuclei//treatment were analyzed, which were ranked in classes from 0 to 4. The analysis of the results significance was done by the Kruskal-Wallis statistical test (p < 0.5). The genotoxic data, obtained by the comet assay, showed that none of the tested cadmium concentrations and corresponding MMS T10 and T5 control groups were included. Percentage of tail DNA (%Tail) and tail moment (TM) were measured using CASP software and compared to negative control. These are preliminary data, which should be further investigated to certify the cadaverine effect over genetic material of the organisms eventually exposed.

**RP068. Evidence of arsenic biomagnification in Patagonian freshwater fish and the potential influence of lipids in arsenic bioaccumulation**

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Arsenic (As) is a highly toxic element released into the aquatic environment from both anthropogenic and natural sources, such as volcanic eruptions. Lake Nahuel Huapi is the largest and deepest oligotrophic lake in North Patagonia, Argentina, located close the Southern Volcanic Zone, an active volcanic arc. Although there are no significant anthropogenic sources of pollution, different levels of As have been recorded in biota from this lake that has been associated to volcanic sources. Most studies on As trophodynamics in freshwater fish webs reveal that total As tends to decrease with increasing trophic level. However, in marine food webs, some authors have found that lipid-soluble As tend to biomagnify. The objectives of this work were to describe As trophodynamics in the food chains of rainbow trout, brown trout and creole perch in Lake Nahuel Huapi, and to relate fish As concentrations to C:N ratios as proxy of lipid content. Predatory fish and their main prey were obtained from the lake and processed in the laboratory, freeze-dried and analyzed by Instrumental Neutron Activation Analysis in the RA-6 research nuclear reactor (Centro Atómico Bariloche, Argentina) to obtain total As concentrations [As] in dry weight (DW). Stable nitrogen isotope ([15N]) analyses were performed to assess the trophic level for As transfer patterns descriptions in each fish food chain. %C and %N were analyzed and C:N ratios were determined to establish the influence of lipids in As bioaccumulation of fish. Higher [As] where observed in muscle of the creole perch (0.7 to 1.9 μg g−1 DW), and lower in salmonids (0.1 to 1.0 μg g−1 DW). A decrease of [As] with increasing trophic level (i.e., biodilution) was observed in the salmonids food chains, following a pelagic-littoral transfer pattern (through the consumption of fish prey); while an increase of [As] with trophic level (i.e., biomagnification) was observed in the creole perch food chain, following a littoral-benthic transfer pattern (through the consumption of crayfish). A positive relationship between [As] and C:N ratios was found, having creole perch the highest C:N ratios and [As], rainbow trout the lowest C:N and [As], and brown trout intermediate values. These results suggest that As bioaccumulation could be favored by lipid contents in fish, with As being more likely to biomagnify in fatty fish via littoral crayfish food chains than with fish with less fat and those more reliant on pelagic sources of food.

**RP069. Genotoxicity of concentrate swine and cattle operation facilities effluents before and after geotextile filtration**

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Concentrate animal operations (CAOs) arise as an environmental issue due to the high volume of toxic effluents generated. Geotextil filtration (GF) is a treatment system where solids are coagulated and retained, while liquids are pumped through a tube constructed of synthetic fiber. Denaturing of sludge and effluents by GF was proposed as an adequate primary treatment to reduce toxicity of wastewaters. Ecotoxicological evaluations of agricultural effluents are scarce and usually focused only on mortality assessments. Genetic damage may be induced by very low concentrations of toxic species (i.e. metals) present in complex mixtures like CAOs-derived effluents. The aims of this work were i) to study the genotoxicity of effluents from two different animal sources: a swine farm (SE) and a cattle livestock market (CE), and ii) to evaluate the ability of GF to reduce this toxicity. Comet assays were conducted on blood erythrocytes of the freshwater fish Ctenedromon decemaculatus acutely exposed (48 hs) to different effluents dilutions. Raw and treated effluents were diluted at two levels, corresponding with their 48h-LC10 and 48h-LC5. Each treatment was tested by quadruplicate using 3 fish per replication. In addition, a negative (dilution water) and a positive (MMS 7.5 mg/L) control groups were included. Percentage of tail DNA (%Tail) and tail moment (TM) were measured using CASP software and compared to negative control. High level of chemical oxygen demand (COD) was measured in CE and fish toxicity was mild (LC50,96h = 67.9%). Nevertheless, raw CE produced significant genotoxic effects at LC10 (p < 0.05). No significant genotoxic effect were observed at LC5. A 99.4% COD reduction and mild fish mortality (LC50,96h > 100%) was observed in GF treated CE. No significant genotoxic effects were observed in fish exposed to undiluted GF-CE. On the other hand, SE showed a high level of toxicity (LC50,96h = 2.2%) and produced a significant increase in genotoxicity parameters at both levels tested. Although, mortality was slightly reduced in GF-SE (LC50,96h = 5.7%), genotoxic effects were shown a marked reduction of 30.7% and 78.3% for LC10 and LC5, respectively. Moreover, the effects in LC5 were similar to that in the control group. Our results highlights that a genotoxicity biomarker is relevant to assess sublethal effects produced by CAOs-derived effluents on freshwater fish and points out that GF is a useful primary treatment in order to reduce effluent toxicity.

**RP070. Gigaspora margarita (Becker & Hall) spore germination in ecotoxicology assay: ISO/TS 10832:2009 adaption for south Brazil soils.**

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The arbuscular mycorrhizal fungi (AMFs) symbionts have a generalized geographical distribution, ecologically relevance for nutrition and health plant and besides, represent a sensible indicator to environmental changes. These particulars among other turn them in a key-group for soil pollutants environmental risk assessment. In Brazil, there are not research protocols or technical normative for guide ecological assays with AMFs, due this reason, the protocol ISO/TS 10832:2009 is used to assess the germination sensibility of these organisms to soil pollutants with Funneliformis mosseae (Nicolson & Gerd.) Walker & Schuessler. The aim of this study was introduce new species of AMFs in ecotoxicology assays ISO, in a way which they be ecologically relevant to Brazilian soils and determine other possible asymptotic growth parameters these fungi, beyond spore germination. Was fulfilled a initial test with spores of G. margarita, incubated in growth chamber the BOD to 24°C (± 2°C), during 14 days, exactly like Protocol ISO in sand and artificial soil (ISO 11268-1) without contaminants. Was noted that spore germination in sand (84.6%) and artificial soil (76.41%) comply with protocol to assay validation. Hereafter, the G. margarita answers were also evaluated in assay with an Oxisol (natural soil representative for South Brazil) contaminated with CdNO3.4H2O in 0; 0,1; 0,2; 0,5; 1,0 and 2,0 Cd Kg−1 doses. There was a reduction in average percentage for spore germination in Cd high doses. However, was not possible calculate the Embryo:Sporangium ratio > 2.0 mg dry g−1, this indicate one complexity assays. For this test, besides de germination rates, was observed the germ tube size and total length of hyphae through the use of stereoscopic microscope and image software (AxioVision 4.8.0). The means were compared with control without contamination besides Dunnett test and were not significantly statistic different in any treatment. An adaptation suggestion for the Protocol ISO/TS 10832:2009, however, needs more information and additional assays with other species of AMFs further others pollutants and soils types.

**RP071. Gill cells of Mesodesma mactroides exposed to copper and osmotic shock: cellular defense protects against citotoxicity?**

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Gills cells of filter feeding mollusks show cellular defense mechanisms, like the multienzymatic resistance (MXR), to extrude those possible contaminants from organisms, once this organ is the first to face the aquatic environment. In order to analyze the cytotoxicity and the cellular defense of the clam Mesodesma mactroides gills, these cells were exposed to copper (0, 1, 5 and 10 μM, nominal concentration) for 5 h in iso- and hyposmotic solutions (osmolality 880 and 600 mOsml/Kg H2O, respectively). This study also intend to identify which MXR methodology analyze is more robust (either fluorimetry or fluorescence microscopy). After to analyze the results of citotoxicity and MXR activity on the gill cells, it was seen that hyposmotic shock cause a decrease around 10% in

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relation to isosmotic solution. The copper presence decreased the viability on isosmotic saline, but did not under hyposmotic shock. About MXR activity, with fluorescence microscopy analyses, it was shown that hypomotic shock active the defense, whereas isosmotic solution inhibited this mechanism, principally when exposed to copper 5 and 10 µM. MXR activity was 30% high at gills cells exposed to hypomotic solution than those in isosmotic solution, but the copper presence did not interfere in this activity. While by flow cytometry analysis the result was the inverse, what may be result of some methodological interference. The high activity of MXR under hypomotic challenge could be caused by the swelling (in hypomotic shock the cells were 35% bigger than in isosmotic solution); because, second the literature, the proteins that confer to cells the MXR phenotype seems to be related to cellular volume-sensitive chloride channels activated during hypomotic swelling. Thus, is possible to conclude that MXR analysis by microscopy is trustful, because denotes a pattern that when the cells cannot defense (less MXR activity), occurs cellular death. It was also seen that under hypomotic condition the cells showed more defense capacity and less cellular death than when maintained in isosmotic condition.

**RP072. Gill histopathology and micronucleus test in Bryconamericus theringii (Boulenger, 1887) captured in two tributaries of the Sinos River basin, Brazil**


The Sinos River basin, located in the state of Rio Grande do Sul, Brazil, provides water for more than 1.5 million inhabitants and suffers from several anthropogenic inputs, being considered one of the most polluted rivers in Brazil. The Ilha River and Paranhana River are the main tributaries of this basin, being under agricultural, domestic sewage and industrial impacts. Thus, this study aimed at evaluating the water quality of two tributaries of the Sinos River basin, using water physicochemical parameters, the gill histopathology and micronucleus test in a native fish species. Superficial water samples and specimens of Bryconamericus theringii (n=40) were collected in four sites (source and mouth of each tributary) in April 2014. Blood and gill samples were collected for micronucleus test and histopathological analyses, respectively. The relative frequency of micronuclei and nuclear abnormalities was evaluated by scoring an average of 2000 mononucleated erythrocytes per individual, while for histopathological analyses, the frequency of normal and abnormal secondary lamellae was recorded in 10 primary lamellae per individual. Statistical analysis was performed using Student’s t test, comparing the source and mouth for each tributary. The results for physicochemical parameters were analyzed according to the Brazilian legislation. Lead and iron values exceed the limits in all sampled sites, while high values of aluminum were found in both mouths. For histopathological analyses, a high increase in secondary lamellae with alterations observed in fish collected in the source of Ilha River when compared to the mouth. Epithelial cells hypertrophy and hyperplasia, epithelial lifting and necrosis were the most frequent lesions. For the Paranhana River, no differences between fish collected in the source and mouth was observed. Regarding to micronucleus test, no significant difference was found between the sources of both tributaries studied are impacted, despite their localization in areas under minor contamination in comparison to their mouths. Although no evidences of genotoxicity was found, an increase of gill alterations was observed in fish collected in the Ilha River, which may be related to agricultural inputs. Further analyses using other biomarkers and collections in different periods are being conducted in order to better estimate the effects of contamination in these water resources.

**RP073. Immunological and health-state parameters in the Patagonian rockfish Sebastes oculatus. Their relation to chemical stressors and seasonal changes**

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Fish inhabiting urban and industrialized coastal areas are often exposed to high levels of complex mixes of anthropogenic pollutants. This exposure can lead to decreased disease resistance, with immunosuppression hypothesized as the main mechanism by which toxicants mediate this decline. We present the results of a field study that evaluates whether exposure to anthropogenic pollution impacts immunological and health-state parameters of wild marine fish in the Peninsula Valdes region (an UNESCO Natural World Heritage area) during the breeding and non-breeding periods. We assessed aspects of constitutive innate immunity (bactericidal competence, natural antibodies, and leukocyte profile) and general health-related parameters (neutrophil to lymphocyte ratio, hematocrit, and condition factor) in the rockfish Sebastes oculatus. Individuals were sampled from polluted (exposed) and reference (control) sites during winter (i.e., coolest temperatures and active reproductive period) and in summer (i.e., warmest temperatures and non-reproductive period). Bactericidal competence, hematocrit, and condition factor were lower in fish from exposed sites independently of season. There was no effect of site or season on the percentages of neutrophils and monocytes, whereas lymphocytes were higher at the exposed site only during summer. Natural antibodies were not affected by exposure to pollutants. The mechanisms involved in altered immune and health-related parameters associated with living in polluted sites could be elicited directly by toxicants, indirectly by stress hormones, or by a combination of both. In addition, fish sampled during winter displayed lower bactericidal competence, hematocrit, and condition factor than those sampled in summer independently of site, whereas the opposite pattern was found for natural antibodies. These results could be explained by life-history theory, which predicts a re-allocation of resources between reproduction and other physiological functions (including immunity) during the most energetically demanding season. In conclusion, our findings show an alteration in immunological and health-state parameters of wild marine fish exposed to anthropogenic pollution independently of season, which could potentially result in higher susceptibility to disease and in turn population dynamics and sustainability. Future studies will include an experimental approach and aspects of acquired immunity.

**RP074. Incorporación, metabolismo y efectos subletales de BDE-47 en dos invertebrados estuarinos con diferente posición trófica**

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El retarding de llama BDE-47 (2,2',4,4'-tetrabromodifeniléter) es un compuesto antropogénico de relevancia ambiental dada su ubicuidad ambiental, potencial de bioacumulación y efectos tóxicos en la biota. Dos bieneos (sedimento-biota (SB) y biota-biota (BB)) fueron desarrollados para simular diferentes vías de incorporación, metabolismo y efectos de estrés oxidativo en dos especies de invertebrados estuarinos (Laconereis acuta y Cyrtograpsus angulatus). En el bieneos SB, los invertebrados fueron expuestos por 14 días a un sedimento fortificado con 2 concentraciones de BDE-47 (<40 y >400 ng/g p.s.). En el experimento BB ejemplares de C. angulatus fueron alimentados con individuos de L. acuta pre-expuestos a BDE-47 (ensayo SB). Los ensayos SB revelaron que el poliqueto L. acuta acumulaba significativamente mayores niveles de BDE-47 respecto a los diferentes tejidos de cangrejo en ambas concentraciones (p<0.05; BMI: bactericidal oxidativo; ACAP: antioxidante). Para los ensayos BB, los cangrejos expuestos a sedimentos fortificados mostraron un incremento significativo de la actividad Glutation-S-transferasa (GST:p< 0.05) respecto a los controles. No se observó peroxidación lípida (TBARS) ni cambios en la Capacidad Antioxidante Total (ACAP) en ambas especies/tejidos. El experimento BB demostró que los cangrejos acumulaban y eliminan cantidades significativas de BDE-47 por medio de fecas (p<0.05). A diferencia de la exposición SB, cangrejos que se alimentaron con poliquetos pre-expuestos a BDE-47, mostraron las respuestas bioquímicas más relevantes. Cambios significativos en GST y ACAP junto con el aumento significativo de TBARS respecto a controles (p<0.05), revelaron que la assimilación previa de BDE-47 representa un potencial fuente de toxicidad hacia sus depredadores. En términos de metabolismo de BDE-47, no se detectaron metabolitos de tipo metoxilado (MeO-PBDEs) en ninguno de los ensayos, sin embargo metabolitos de tipo hidroxilado (OH-PBDEs) fueron detectados en poliqueto y tejido/fecas de cangrejos de ambos experimentos. Los resultados demuestran que la hidroxilación de tetra-PBDEs emerge como una ruta importante de biotransformación de PBDEs en invertebrados estuarinos, que estaría asociada a las respuestas de estrés oxidativo encontradas en el presente estudio.

**RP075. Micronuclei and comet assay in adult Cestoderus decemmaculatus as indicators of genotoxic effect in environmental samples**

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The aim was to assess the genotoxic impact of the water from the Reconquista river (high basin) with and without a pollution pulse aggregate (Cd). Samples for the assays were taken at Ing. Roggero dam in the spring of 2013 and fall of 2014, and the physico-chemical profile was determined. Assays during 96 h, with controlled temperature and photoperiod (22°C, 16L:8D), 7-day acclimation in moderately hard water (MHW) with ad libitum feeding. 200 adult C. auratus were collected from the culture tank and were used; weight 107.10 ± 4.26 mg and length 24.89 ± 0.27 mm (median ± ESM) and were distributed to five groups: [1] river water (Rg), [2] river water + 2 ppm Cd (RgCd), [3] MHW + 2 ppm Cd (Cd) (positive control metal), [4] MHW + 5ppm cyclophosphamide (CP) (positive control genotoxicity) and [5] MHW (negative control-CN). The assay was carried out by replicate (n/replicate) with a medium renewal at 48 h and continued aeration. At the end of the experiment, animals where anaesthetized in cold and blood was drawn. For MN, slides preparations were fixed with methanol and stained with Giemsa. A count was performed in 1500 blood cells and the frequency with respect to CN. ANs in all treatments increased significantly with respect to CN. ANs in all treatments increased significantly with respect to CN. In the next assay, there was a significant increase in MNs from animals exposed to CP and Cd and no differences were observed in ANs. Regarding EC, a significant increase was observed in all treatments compared to CN in IDG. These results allow us to conclude that, under our experimental conditions, the water sample from Reconquista River is potentially inductive of genomic instability in blood cells from C. decemmaculatus, which is increased by the aggregate of a pulsating pulse of Cd.

RP076. Morphological and histopathological alteration in the mussel Brachidontes rodiguezi associated to polluted marine coastal areas.

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The objective of this study was to determine the presence of morphological and cellular indicators of pollution in the intertidal mussel Brachidontes rodiguezi. For this propose two sites were selected: Villa Gesell (VG) and port of Mar del Plata (MP). The population present in MP is under stress due to the presence of several contaminants in the water, while VG was selected as a clear reference site. Small portions of digestive gland, gonad and gill were fixed, dehydrated and embedded in resin for their histological analysis. In order to quantify the atrophy of the digestive gland five planimetric parameters were analysed: MET, mean epithelial thickness; MLR, mean luminal radius; MDR, mean diverticular radio; MLR/MET and MET/MDR. Significant differences between populations were observed in all the parameters studied, being the ratios MLR/MET and MET/MDR the best indicators of the digestive tubule morphology. Since under normal conditions the higher the digestive cells number the more effective is the digestive process, under but different stress situation the relative occurrence of basophilic cells increased, the volume density of basophilic cells (VVsbas) was calculated. VVsbas values were much higher in MP population, indicating a cell type replacement situation. Taking into consideration the normal structure of the gill epithelial cells, mussels sampled from MP showed morphological alteration e.g. mucocytes and haemocytes increased. In MP population a more marked incidence of atretic oocytes and atrophic spermatogenic tubules were observed. An analysis of mussels’ shell shape from VG and MP areas were performed using geometric morphometric, and significant differences in shell shape among localities were detected.

RP077. Multibiomarkers in fish to evaluate environmental health of a tropical coastal lagoon

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In this study we intended to investigate the reproductive aspects (gonadosomatic index), condition factor (hepatosomatic index) and genotoxicity endpoints (Micronuclei test and Comet assay) on freshwater fish under a long term exposure to elutriate produced from sediment samples collected in a tropical coastal lagoon subjected to inputs of metal contamination. To this aim, sediments samples were collected from a Brazilian coastal lagoon that receiving wastewater from a mining industry and in a reference coastal lagoon. The toxicity assay was performed with exposure to elutriate prepared as the Preservation Procedure and Sample Preparation (ABNT - NBR 15469) in the ratio 1: 8. Total of 32 specimens of Geophagus brasiliensis were randomly distributed in four groups of eight animals each and exposed for 21 days under a semi-static condition. The experimental design was as follows: a) Negative Control group (NG); b) elutriate produced from a reference coastal lagoon (R); c) elutriate produced from coastal lagoon that receiving wastewater from a mining industry (MI); d) elutriate produced from a reference coastal lagoon with the addition of 71µg/L of manganese (R+Mn). We observed that the gonadosomatic and hepatosomatic index values showed no statistically significant difference between experimental groups. Concerning genotoxicity endpoints, the Micronuclei frequencies did not reveal any significant different between experimental groups, conversely, in both contaminated groups (MI and R+Mn), the damage index obtained from the technique of Comet assay was significantly higher than the negative control and unpolluted reference lagoon. These results indicate that the Comet assay gives sensitive results in assessing genotoxic damage and that the Neotropical fish G. brasiliensis is a promising “sentinel organism” to detect the genotoxic impact of metal contamination in coastal lagoon ecosystems.

RP078. Mutagenic potential of the residues from marble and granite polishing

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The beneficiation process of ornamental stones such as marble and granite includes a polishing stage, in which resins and abrasives are used, producing fine grained residues with high moisture content. These residues pass through decantation tanks for the liquid phase separation and reuse in the beneficiation process; however, the liquid effluent is often released illegally directly to water bodies. Until now, there is no knowledge about the mutagenic effects that this material can cause to the organisms exposed to it. Thus, this study evaluated the mutagenic potential of the residues from marble and granite polishing in onion root cells and fish erythrocytes. The material used was collected in a factory in Cachoeiro do Itapemirim, Espírito Santo, Brazil. The onion seeds were germinated in Petri dishes with filter paper imbibed in water according to the treatments: Negative control (distilled water); Lake (water collected in the lake that supply the company); Residue (liquid phase of the polishing residue collected in the decantation tank); Resin (resins dilution used for polishing). After the germination, the onion roots were fixed and prepared for analysis of chromosomal aberrations in meristematic cells. The Fishes were exposed for 72 hours in 50 liters tanks according to the treatments: Negative control (water from artesian well); Lake (50 liters of artesian well water and 2.0kg of sediment collected in the lake that supplies the company); Residue (liquid phase of the polishing residue collected in the decantation tank); Resin (resins dilution used for polishing). Blood samples were used to prepare blood smears for the counting of micronucleus and nuclear abnormalities. The onion seeds had similar germination and mitotic index in all treatments. However, it was observed in the seeds exposed to the polishing residues, numbers of micronuclei and nuclear buds were observed in the control and the treatment. The fishes from all treatments showed significant increase in nuclear abnormalities when compared to the negative control. The residues analyzed showed mutagenic potential in the conditions studied; this effect can be related to the high content of phenolic compounds identified in the samples.

RP079. Mutagenic potential of water bodies under the influence of P. taeda plantations (Coniferae)


The P. taeda plantations have led to serious and irreversible changes in the environments where they are being introduced leading to loss of biodiversity. This research aimed to evaluate the mutagenic potential of water samples collected from sources with different distances from P. taeda plantations. Samples were taken from winter of 2013 until autumn of 2014 in two cities: São José dos Ausentes (SJA) where there is a low incidence of Pinus and San Francisco de Paula (SFP) site with a high incidence of Pinus. Phenolic compounds were quantified by the Folin-Ciocalteau method. The test Salmonella/microsome by microsuspension method using the basic strains...
TA97a and TA98 in the presence and absence of S9 mix was used to analyze the mutagenicity. The significance of the dose response curve was analyzed using the software SALANAL. The levels of genoplic in SFP was highest in spring (22.18±0.14 mg/L) while in SJA weren’t detected. The difference in the levels of water-soluble genoplic in the water body near the planting of P. taeda is probably due to the fact that in the spring to be the cutting time of this conifer and this fact increases the amount of needles deposited in the water. In mutagenicity analysis of SFP water all samples showed positive response indicating mutagenic potential and the highest values were present in spring. The samples collected in SJA had all negative results. The water sample collected in the spring showed higher mutagenic values than the other seasons which corroborate with genoplic levels quantified in samples which were also higher in the spring. Dutra (2012) confirmed through analysis of the extracts by HPLC that the compositions of phenolic change seasonally and this variation leads to changes the extract toxicity and is probably responsible for the intensification or decreases the deleterious effects of P. taeda. The results obtained so far are critical to the expansion of knowledge of the impact of silviculture in limnic environments.

RP080. Nicotianat tabacum var. ‘Bel W3’ (tobacco) as bioindicator of ozone in the city of Porto Alegre and metropolitan region, RS, Brazil

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The ozone (O₃) is a very strong oxidant, cytotoxic, phytotoxic and that even in low concentrations can affect the respiratory system and also damages natural vegetation and agriculture. It is formed through photochemical reactions and can be produced far from the main pollution sources being transported by hundreds of kilometers and impacting regions that are very distant from its origins. The plant Nicotiana tabacumLv. Variety BelW3 (tobacco) is often used to evaluate the existence of ozone in the environment. The objective of this study was then to verify the presence of O₃ concentrations by using N. tabacum BelW3 in areas of Porto Alegre and metropolitan region RS, Brazil. The study was carried out from October 2014 to April 2015 in six areas: A1 and A2/UFRGS/Campus Porto Alegre, A3/Humaitá Neighborhood, Porto Alegre/A4/Guaújuiras Neighborhood-Canoas, A5/Orvisa Neighborhood-Charqueadas and A6/Petrochemical Complex-Triunfo. The tobacco plants were placed in six pots per study area and exposed during 14 days in each exposure period (11 periods). In the laboratory some calculations were carried out, as the foliar injury index (FII), the severity index (SI), biomass, specific leaf area (SLA) and total chlorophyll. The data were analyzed through ANOVAs followed by Pearson correlation analyses. The greatest percentage of FII was of 49.4% in the 9th period in the area A1, also showing low mean values of biomass (0.08g) while the SI was of 86.1% in the A5 in the 2nd period. The greatest mean values of SLA (30.3m2/262.9cm) were found in the regions A5 and A6 in the 1st period. For total chlorophyll, the lowest value (0.332mg/g) occurred in the 4th period in A5. Significant differences were recorded in the Sl/df=5,197,F=4.44>P<0.001) among the area A1 in relation to A5 and A6. For the SLA (df=39,151;F=1.106;P<0.001) and the total chlorophyll (df=39,151;F=1.001) there was absence among the exposure periods. In 90% of the sampled areas significant correlations were recorded among biomass, SLA and the total chlorophyll with all the variables temperature, air relative humidity, precipitation, vehicular traffic and the levels of O3. The ozone sensitive N. tabacum BelW3 responded to the signals and the characteristic symptoms for the presence of O₃ in all the evaluated areas varying in intensity and/or frequency. The use of this plant in Southern Brazil showed to be efficient among biomass, SLA and the total chlorophyll with all the variables temperature, air relative humidity, precipitation, vehicular traffic and the levels of O3. The ozone sensitive N. tabacum BelW3 responded to the signals and the characteristic symptoms for the presence of O₃ in all the evaluated areas varying in intensity and/or frequency.

RP081. Physiological responses in C. deccemmaculatus extracts from samples collected from Reconquista River and cadmium.

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The aim was to assess the effects of subchronic exposure to samples from Reconquista river water and cadmium on ingestion (I) and assimilation efficiency (%). The experimental design to recover C. deccemmaculatus from water sample was taken on the spring of 2014 from the source of the main course; it was physicochemically characterized, filtered and stored at 3°C until its use. Assay organisms were adult (N:238;body weight:31.11-169.1mg;length:17.79-31.85mm);both sexes,coming from the laboratory culture. The experiment was carried out in quadruplicate/sextuplicate,after a 14-day acclimation in moderately hard water (MHW),with partial renewal every 9th,food supply ad

libitum. Environmental conditions (aeration,T:23±1°C, photoperiod of 16L:8D and dilution medium) were constant from acclimation. 4 acarium were destined to filtered water from Reconquista river (RR),5 to 0.5 mg Cd/L MHW (Cd) and 6 were destined to controls (MHW). Exposure was extended throughout 12 days. At baseline, the total biomass was registered by each replicate. Food (daily 2%) of the total/rePLICATE biomass) was offered after removing feces (H) during 60min, and food (daily 2%) of the total/rePLICATE biomass) was added. Excess food and produced H were drained until constant weight and weighed, H (expressed in animal mL/mg) and % U (H/P*100) were calculated. Recovery in MHW extended through 24 days and was assessed in 1 replicate of Cd, 3 RR and 3 MHW. Daily pH,medium hardness and survival were registered. H was calculated and nominal Cd concentration was measured. At exposure and recovery end time, the condition factor (CF) was determined for surviving animals from each treatment. Statistical assessment of the results was performed using ANOVA or Kruskal Wallis. Mortality in RR was less than 10% comparable to MHW throughout the assay and for the Cd group it was progressive through time and was at 57% at exposure end time, lowering to 33% at recovery end time. FC did not register significant differences between groups, nor between both stages of the assay. The I of the RR group did not differ from MHW throughout the assay; however, it showed a %U significantly higher compared to MHW in the exposure stage, which was compensated during recovery. Cd group showed a significant reduction in I with respect to MHW and RR throughout the assay, but showed a significant recovery of %U. Under experimental conditions, an imbalance of %U during toxic stress can be predicted, as well as its restoration in a control situation.

RP082. Potencial de Kerchneria obesa e Ankistrodesmus gracilis como fontes de alimento para cladóceros utilizados em estudos ecotoxicológicos

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O presente estudo visou avaliar fontes alternativas de alimento a Raphidocelis subcapitata, usualmente utilizada na manutenção de cultivos de cladóceros para uso como organismos-teste em ensaios de toxicidade. Experimentos quantificando I e assimilação eficiência foram realizados durante 14 dias em cada período de exposição (11 períodos). No laboratório, análises estatísticas de médias foram realizadas. Os resultados foram: 1) em maturidade mediana apresentou-se um aumento no valor de assimilação eficiência (60,4% ± 27,8% ovs./fêmea) nos meses de inverno, resultando no aumento do p/0,002, 2) a mais alta média de assimilação eficiência foi registrada no mês de outubro (64,3% ± 29,4% ovs./fêmea), e 3) os melhores coeficientes foram registrados no mês de maio (58,3% ± 43,4% ovs./fêmea). Os resultados foram significantemente superiores aos obtidos utilizando Raphidocelis subcapitata (18,9 ± 3,2% ovs./fêmea) e 4,2 ± 2,9% ovs./fêmea), com p = 0,00 e p = 0,002, respectivamente. Estes resultados, diferiram dos obtidos para as duas outras espécies de cladóceros, as quais apresentaram baixa assimilação eficiência. Os resultados obtidos no presente estudo com D. similis e C. silvestrii, mantendo as mesmas condições iniciais, exceto a concentração inicial de K. obesa (3X maior) mostraram melhor desempenho reprodutivo apenas para C. silvestrii. Suas fecundidade média correspondeu a 31,1 ± 2,29 ovs./fêmea e longevidade de 19,8 ± 5,1 dias. No entanto, a morte considerada (3x maior) mostrou um dos melhores experimentos com R. subcapitata mostrou as médias de 58,3% ± 43,4% ovs./fêmea (p = 0,03) e longevidade de 23,2 ± 9,3 dias (p = 0,029). Por outro lado, o experimento em andamento para D. similis, utilizando A. gracilis isolada e associada a K. obesa (50% de cada), está demonstrando a possibilidade de adoção das duas espécies de algas nativas como alimento para as espécies estudadas.

RP083. The effect of a realistic concentration of commercial clomazone in the bullfrog tadpoles

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In the world the Brazil is one of ten largest agricultural countries and to support this production are using a wide range of agrochemicals. These agrochemicals can be carried to aquatic environments and affect amphibian populations that enter in contact with them. The commercial formulation of lomazone herbicide is
the most used in southern Brazil, this formulation has adjuvants in their composition, besides the active principle, these may be acting and causing effects on living beings. Studies with fish showed its toxic effects to aquatic vertebrates and, therefore, it is need to evaluate the toxicity of this herbicide in amphibian tadpoles. In this context, our purpose was evaluate the effect the commercial formulation of clomazone herbicide in the liver of bullfrog tadpoles (Lithobates catesbeianus) subjected to ecotoxicological assays by acute exposure (96h) in a realistic concentration of 0.5 mg/L, using morphological biomarkers as analysis parameters: count melanomacrophage aggregates and histopathology of liver tissue. The tadpoles were randomly divided into aquariums (25L) of clomazone-exposed and control groups (N=10 each), essayed in triplicate. After exposure, the animals were sacrificed, their liver collected and routinely processed for inclusion in historesin for morphological analysis. The results showed significant increased frequency of aggregates melanomacrophages cells (MMC) in the liver in all clomazone-exposed group compared with the control groups, statistically confirmed (p < 0.0001), as well as the largest accumulation of granulocytes (immune cells) and granuloma in some regions of the hepatic parenchyma only in clomazone-exposed group. The function melanomacrophages cells is erythrocytes senile metabolize, destroy foreign organisms and xenobiotics, and protein antigenic secrete. These results show an inflammatory response in the tadpoles exposed to realistic subletal concentration of this herbicide, revealing its importance for the environmental monitoring of amphibians in impacted aquatic areas.

RP084. The impact of clomazone in its free form and associated to nanoparticles in the bullfrog tadpoles

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Several factors have been pointed as causes to the amphibians’ decline worldwide, among them is the aquatic environmental pollution. Agrochemicals usage in Brazil is intense, but there are few studies that assess their effects on amphibian populations. The herbicide clomazone is widely used in rice fields (immunohistochemistry, in the liver of bullfrog tadpoles (Lithobates catesbeianus), which were exposed to the herbicide clomazone, in its free form and associated to the nanoparticles. We used the realistic concentration of clomazone (0.5 mg/L). For ecotoxicological assays by acute exposure (96h), tadpoles were randomly divided into aquariums (25L) of clomazone-exposed, its free form and nanoparticle-associated, and control groups (N=10 each), essayed in triplicate. After exposure, the animals were sacrificed, their liver collected and routinely processed for inclusion in paraffin and SOD and HSP70 immunohistochemical analysis. The results showed stronger positive immunolabeling for SOD in hepatocytes of liver from tadpoles exposed to the herbicide clomazone, in its free form and associated to the nanoparticles, than hepatocytes from control and nanoparticles-exposed groups. However, in tadpoles exposed to both only nanoparticles or clomazone-associated nanoparticles the HSP70 labelling in liver hepatocytes was drastically reduced, which could disrupt the cellular functions of hepatocyte at long-term since HSPs have chaperone function and, therefore, possible proteotoxic damage induced by clomazone (indirectly showed by increase of SOD) would not be corrected. The data showed that the immunohistochemistry is a very useful tool in environmental toxicology because the data may indicate deviation from homeostasis of organs of animals exposed to environmental contaminants, providing data that contribute to the studies of environmental risk assessment.

RP085. Toxic potential of sewage sludge in Xiphophorus maculatus gills.

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The city of Vitória is the first Brazilian capital to treat 100 per cent of the collected sewage. The largest sewage treatment plant (STP) serves about 19,000 inhabitants. At this STP the sewage is treated with aerobic microorganisms and the organic matter forms a petty mass called activated sludge. Due the high concentration of nutrients the sludge is used in the agriculture as organic fertilizer. However, heavy metals and other compounds can be leached causing harmful effects to aquatic organisms. To evaluate the toxic potential of this STP, a bioassay was conducted with the platyfish, Xiphophorus maculatus. For this, 10 fishes were exposed for 7 days in 4 treatments: a negative control (NC) and 3 treatments with dilutions of the sludge in tap water (T1=25g/L; T2=50g/L; T3=100g/L). The tanks were maintained under constant aeration, allowing the sludge to circulate in the water column. At the end of the experiment, the animals were sacrificed and their gills subjected to histological routine. The histological changes were quantified and multiplied by an importance factor (IF), with values 1 to 3, according to the severity of the alteration. The obtained values were statistically analyzed using the Kruskal-Wallis test. The alterations observed were: proliferation of the epithelium of the filament; fusion of secondary lamellae; congestion of secondary lamellae; epitheloct; lamellar disruption and aneurnys. The most frequent alterations were: proliferation of the filament epithelium (IF-2) and congestion of secondary lamellae (IF-3). The statistical analysis demonstrated significant differences between some treatments as follows: NC=T1<T2=T3. Those data showed that the increase in sludge concentration resulted in an increases of gill alterations. Another fact that should be taken into consideration was the presence of epiteliocystas, which indicate the presence of pathogenic microorganisms in the gills. This fact reinforces the incapability of lyophilization, and suggests the use of an organic fertilizer and the restriction of its use in cultures where the sludge is in direct contact with the edible portion.

RP086. Toxicidad de acetamiprid y pyriproxyfen sobre huevos de Chysopera externa (Neuroptera: Chrysopidae)

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El Manejo Integrado de Plagas (MIP) incluye el control biológico a través de enemigos naturales (EN) como uno de sus principales estrategias de control. La permanencia de los EN en ambientes agrícolas, está supeditada a la toxicidad que los plaguicidas presentes tengan sobre estos organismos. Los insecticidas neonicotinoides (como el acetamiprid) se encuentran entre los más utilizados para el control de plagas insectívoras. En los últimos años, se ha comenzado a utilizar insec tidas reguladoras de crecimiento, que a priori serían más selectivos. Entre éstos, se destacan los miméticos de la hormona juvenil como el pyriproxyfen. Asociados a las plagas hay depredadores que ejercen una acción reguladora importante, pero que pueden ser sensibles a estos insecticidas. Chysopera externa es un depredador con elevado potencial para ser considerado un agente de control biológico. En este trabajo se evaluó la toxicidad de laboratorio efectos letales y subletales de los insecticidas acetamiprid y pyriproxyfen, sobre huevos de C. externa. Se realizaron las concentraciones recomendadas para uso en el campo (MCRC) y diluciones del 50, 25 y 12,5% de los formulados comerciales Mospilan® (20% acetamiprid) y Epingle® (10% pyriproxyfen). La exposición se realizó por inmersión de huevos de ≤24h de edad. Por tratamiento se realizaron 5 repeticiones de 10 individuos. Cada 24h y hasta que los individuos llegaron a adultos, se evaluó la supervivencia y la duración de los períodos intermuda. A partir de esto, se calculó la supervivencia acumulada, la supervivencia por estadio y el tiempo medio de supervivencia. Acetamiprid fue menos selectivo que pyriproxyfen, reduciendo la supervivencia acumulada de los organismos expuestos a todas las concentraciones. Pyriproxyfen, solo redujo la supervivencia a las máximas concentraciones. Las MCRC de ambos insecticidas indujeron menores tiempos medios de supervivencia respecto a los del campo, evidenciando mayor celeridad de acción. En ambos insecticidas, la mayor toxicidad se observó en los estadios más cercanos al de exposición. Este estudio corrobora la incompatibilidad del uso conjunto de acetamiprid y C. externa en programas de MIP, además, la selectividad de pyriproxyfen es discutida. PICT2010-0891.

RP087. Toxicity and resilience studies in a petri dish: pH modulation by zebrafish (Danio rerio) embryo

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The zebrafish, a small tropical fish in the rivers of South Asia, has become one of the most popular model organisms in developmental biology and ecotoxicology. Acidifications of continental waters both as a result of acid rain and chemicals, like for instance Al and glyphosate, represent a major threat for the
living organisms. In waters where acidification is most likely to occur, the early life stages of many freshwater fish species could be close to their survival threshold. The main purpose of this study is to evaluate the resistance capacity of zebrafish embryos to a range of low pH values and to report the capacity of early life stage organisms to modify their environment toward their benefit for surviving. For the experiments, the zebrafish medium was prepared with ISO standard pH 7.0, and conditions were set at 4.5 and 5.5 a combination of 0.1M citric-acid and 0.1M sodium citrate buffer in zebrafish medium were prepared. The controls were maintained in Zebrafish ISO solution, pH 7. Each experiment was replicated three times with twenty gastrula stage embryos selected randomly and maintained in a chamber with 10 mL test solution. Survival and the pH in each chamber were measured every day during one week and dead embryos were removed. The pH 3.5 resulted in 100% of mortality within 72 hr. The pH 4.5 and 5.5 resulted in 30% and 45% of mortality respectively after 7 days while in control embryos the mortality was 13%. It is noteworthy that the pH in the maintaining media increased gradually in all experimental conditions toward pH 8, including in the case starting from pH 3.5. The control pH conditions that is the media with citrate buffer alone with pH of 3.5, 4.5 and 5.5, the pH did not change during the whole period. Our results confirm that low pH conditions affect severely zebrafish embryo survival. However an acidic condition as low as 4.5 could result in the survival of 70% of the embryos. The embryos, even as dead organisms (notoriously pH 3.5 condition) were able to neutralize the acidic media. In a fact also reported in our laboratory with amphibian embryos in front of different conditions resulting in low pH like for instance aluminium and glyphosate. Our results point out in just one experiment, the selectivity of the most resistant individuals, in this case to low pH, and the cooperation of the whole population toward a better environment for the species supporting resilience in ecotoxicology and the GAIA theory. 

RP088. Toxicity assessment of orange vinasse
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Vinasse is a byproduct obtained from different raw materials, such as orange, sugarcane, corn and beet. The manufacturing process of orange juice produces, daily, high volume of solid and liquid waste. Solids waste, consisting of the peel, seed and pulp, can be reused as animal feed; the liquid waste, obtained as a bagasse byproduct, is the vinasse. Among the alternatives for its reuse, there is the fertirrigation in agriculture. However, its application has been challenged due to the low pH, and the cooperation of the whole population toward a better environment for the species supporting resilience in ecotoxicology and the GAIA theory. Inadequate processes of mine closure can contaminate the environment due to a lack of planning of waste disposal. Currently, the effects of releasing the wildlife health by exposure to mining residues have generated public and scientific concern. Accumulation of these residues without treatment on the soil may affect terrestrial plants used for human consumption. The aim of this study was to assess the toxicity of elutriates obtained from soils contaminated with industrial waste. Elutriates did not contain an abundant number of microorganisms - including chromosomal aberrations indexes, the nonparametric Kruskal-Wilk test. The analysis of normality of the data was verified by the Shapiro-Wilk test. The parametric test ANOVA/Tukey with significance p < 0.05 was used for statistical analysis of mitotic index due to the normal distribution given by this parameter. For non-parametric indexes such as chromosome, chromosomal aberrations indexes, the nonparametric Kruskal-Wallis/Dunn with significance p < 0.05 was used once the data were not normally distributed. According to the results, vinasse, in both dilutions, showed cytotoxic effect. Decreased mitotic index, chromosome aberrations and micronucleus formation were observed. Thus, the use of such product in agriculture is of utmost concern, once it showed harmful effects in the DNA of the organism tested. Financial support: FAPESP (processes 2014 / 17998-7, 2012 / 50197-2)

RP089. Toxicity of a joint formulation of imazethapyr and glyphosate in Scenedesmus vacuolatus
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To minimize the emergence of resistant weeds and to achieve a more sustainable control, herbicides mixtures have been developed. Many environmental factors can induce oxidative stress (OS). Particularly, the exposure to xenobiotics can trigger OS processes, where reactive oxidative species (ROS) levels are increased, resulting in changes at the cellular level. The aim of this work is to analyze the participation of OS in the phytotoxicity of a mixed commercial formulation, OneWay®, containing imazethapyr 2% and glyphosate 24%, in Scenedesmus vacuolatus. This green microalga was exposed to OneWay, concentrations corresponding to 0-6 mg imazethapyr/L, added to the medium, and BcoO (formulation mixture without active ingredients corresponding to the highest concentration of the tested formulation). Cultures were grown at 24±1°C, under continuous light and agitation. After 96 hr, cultures were evaluated for cellular growth (EC50); gluthathione-S-transferase activity (GST, a metabolic parameter); TBARS (a lipid peroxidation parameter) and pigment contents, antioxidant defenses (catalase-CAT- and superoxide dismutase-SOD-activities) and gluthione levels (GSH, non-enzymatic antioxidant). Cell growth was significantly reduced from 4 mg imazethapyr/L, with a EC50 of 3.23 mg/L (IC95: 2.85-3.66). The chlorophyll a/chlorophyll b, chlorophyll a/total chlorophyll a ratios did not vary significantly for any tested concentration or for the BcoO. The content of TBARS showed no significant variations in the concentrations tested. GST activity increased significantly at 4 mg/L, as well as in BcoO. GSH levels also increased significantly in a concentration dependent manner from 4 mg/L, as well as for BcoO. CAT activity presented a significant increase at 6 mg/L, while SOD activity did not vary significantly. The OneWay® formulation caused growth alterations in Scenedesmus vacuolatus. GST activity increased, indicating greater detoxifying activity, as well as GSH content and CAT activity, indicating a greater antioxidant protection. This would seem to mitigate the action of ROS and therefore no damage to lipids was observed and neither were modified pigment ratios. BcoO also caused metabolic changes in the microalgae, on decreasing the activity of the GST and GSH level. This would seem to mitigate the potential toxic effects of this component of the formulation since no alterations were observed in the microalgae growth.

RP090. Toxicity of elutriates from soils contaminated with residues from an abandoned gold mine in Marayes (San Juan, Argentina) on lettuce and radish. P. Milani, Universidad de Buenos Aires / Cátedra de Química Analítica Departamento de Recursos Naturales y Ambiente Facultad de Agronomía; G. Roqueiro, INTA / Estación Experimental Agropecuaria San Juan; R. Tapia, Universidad Nacional de San Juan / Facultad de Ciencias Exactas Físicas y Naturales; P. Monetta, INTA / Estación Experimental Agropecuaria San Juan; B. Lagro, Instituto Nacional de Tecnología Agropecuaria / Laboratorio de Transformación de Residuos Instituto de Microbiología y Zoología Agrícola CICYVYA; M. Bargielu, Universidad de Buenos Aires / Cátedra de Química Analítica Departamento de Recursos Naturales y Ambiente Facultad de Agronomía; B.J. Young, Instituto Nacional de Tecnología Agropecuaria / Laboratorio de Transformación de Residuos Instituto de Microbiología y Zoología Agrícola CICYVYA

The main purpose of this study was to assess the resistance capacity of lettuce and radish to evaluate the resistance capacity of Scenedesmus vacuolatus to the observation of its adverse effects. Thus, this study aimed to evaluate the toxicity of orange vinasse to investigate the possible cytotoxic and genotoxic effects and chromosomal instability in Allium cepa (onion). The bioassay consisted in exposing, in Petri dishes, approximately 100 onion seeds directly to vinasse diluted (2.5% and 5%). For the negative control was used ultrapure water and for the positive control, methyl methanesulfonate (MMS). The bioassay consisted in exposing, in Petri dishes, approximately 100 onion seeds directly to vinasse diluted (2.5% and 5%). For the negative control was used ultrapure water and for the positive control, methyl methanesulfonate (MMS). The bioassay consisted in exposing, in Petri dishes, approximately 100 onion seeds directly to vinasse diluted (2.5% and 5%). For the negative control was used ultrapure water and for the positive control, methyl methanesulfonate (MMS). The bioassay consisted in exposing, in Petri dishes, approximately 100 onion seeds directly to vinasse diluted (2.5% and 5%). For the negative control was used ultrapure water and for the positive control, methyl methanesulfonate (MMS). The bioassay consisted in exposing, in Petri dishes, approximately 100 onion seeds directly to vinasse diluted (2.5% and 5%). For the negative control was used ultrapure water and for the positive control, methyl methanesulfonate (MMS). The bioassay consisted in exposing, in Petri dishes, approximately 100 onion seeds directly to vinasse diluted (2.5% and 5%). For the negative control was used ultrapure water and for the positive control, methyl methanesulfonate (MMS). The bioassay consisted in exposing, in Petri dishes, approximately 100 onion seeds directly to vinasse diluted (2.5% and 5%). For the negative control was used ultrapure water and for the positive control, methyl methanesulfonate (MMS).
RP091. Understanding mechanisms of action of pesticides in *Folsomia candida* using a proteomics approach

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Colembolans have been traditionally used as soil health indicators through the assessment of effects at the population level. To further understand the mechanisms of toxicity behind pesticide contamination and elucidate the chemical modes of action, it is important to complement such information with responses at lower levels of biological organization. Ecotoxicoproteomics provides adequate and pillar techniques for such holistic understanding of the interaction of stressors with organisms. Folsomia candida is a common and widespread arthropod that has been extensively used as a “standard” test species for estimating the effects of pesticides and environmental pollutants on non-target soil arthropods, being very sensitive to organic compounds. The main aim of the present study was to address the mechanisms of toxicity of two pesticides, widely used in agriculture, on *F. candida* by trying to establish the link between the effects on reproduction with protein expression patterns. For the assessment of survival and reproduction effects (ISO 11267:1999), the organisms were exposed to the herbicide glyphosate (30.8 % Montana®) and the fungicide chlorothalonil (38.8% Bravo®500) in a Portuguese agricultural soil and several effect concentration values (ECX) were estimated. Organisms were then exposed to the reproduction EC50 of each pesticide (glyphosate: 4.95 mg a.i./kg; chlorothalonil: 127.31 mg a.i./kg), as well as to control conditions, and several time points were tested: 2, 4, 7 and 10 days. After protein extraction and quantification, each sample of control and pesticide-exposed organisms followed a shotgun proteomic approach based on liquid chromatography and tandem mass spectrometry (LC-MS/MS), combined with iTRAQ (isobaric tags for relative and absolute quantitation) labeling that allows comparative quantitative multiplex analysis. Different sets of differentially expressed proteins were identified after exposure to each pesticide, indicating the distinct biological and metabolic pathways that are being affected. It was also possible to verify that the pattern of protein expression changed over time. The present results represent the first attempt to link individual responses of *F. candida* (effects on reproduction) with the proteome modifications, providing the scientific basis for a more comprehensive understanding of the mechanisms underlying the individual responses to the pesticides.

RP092. Wastewater coffee toxicity in *Lactuca sativa* and *Oreochromis niloticus*

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The wet processing of coffee is used to produce a better quality coffee bean, which leads to a tastier beverage. However, this process uses a large amount of water, giving rise to a great volume of effluents with high concentrations of organic matter and agrochemicals residues. Since this effluent is usually discharged directly on the soil without knowledge about its impact on organisms, this study aimed to evaluate the toxic potential of this effluent, using two test organisms: lettuce seeds (*Lactuca sativa*) and fish (*Oreochromis niloticus*). Lettuce seeds were germinated in Petri dishes lined with filter paper imbibed with dilutions of the effluent in distilled water as follows: 0%, 1.25%, 1.66%, 2.5%, 5%, 10%, 20%, 100% and positive control (MMS). It was analysed the germination, root growing rate, chromosomal aberrations and nuclear abnormalities in meristematic root cells. Fishes were exposed for 4 and 8 days in dilutions of the effluent in dechlorinated tap water, as follows: 0%, 1.25%, 1.66%, 2.5%, 5%, 10%, 20%, 100% and positive control (MMS). It was analysed the germination, root growing rate, chromosomal aberrations and nuclear abnormalities in meristematic root cells. Fishes were exposed for 4 and 8 days in dilutions of the effluent in dechlorinated tap water, as follows: 0%, 1.25%, 1.66% and 2.5% with dilutions of the effluent in distilled water as follows: 0%, 1.25%, 1.66%, 2.5%, 5%, 10%, 20%, 100% and positive control (MMS). It was analysed the germination, root growing rate, chromosomal aberrations and nuclear abnormalities in meristematic root cells. Fishes were exposed for 4 and 8 days in dilutions of the effluent in dechlorinated tap water, as follows: 0%, 1.25%, 1.66%, 2.5% and 5%. It also generated significant increase in morphological alterations in gill and liver, that could compromise the function of both organs. Therefore, the bioassays conducted in the present study demonstrated that the coffee wet processing generates an effluent that is toxic to vegetals and animal.

Environmental Monitoring

RP094. A field survey to assess the occurrence of pollinators in sugarcane cultures in Brazil

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Insect pollinators are potentially attracted to sugarcane fields by three available resources during commercial sugarcane cultivation: the post-harvest sap exuding stools offering a liquid sugar source, occurrence of flowers offering nectar and pollen source, and the honeydew secreted by sugarcane pest species offering a liquid sugar source. As sugarcane is normally harvested before flowering under typical Brazilian cropping conditions, there is no exposure of pollinators during flowering of the crop. However, after harvest of the crop, the sugar-containing sap may leak out of the cut face of the cut stem and may attract pollinators. The aim of this study was to assess the occurrence of hymenopteran pollinators in fields of sugarcane under typical cropping conditions in Brazil. The field study was carried out after the harvest of sugarcane from the end of October until the beginning of December 2013. In 16 fields distributed over 2 representative growing areas in Brazil the major hymenopteran pollinator taxa present in sugarcane were assessed at three points of time related to the harvest period. The assessments were done at 3 different locations within and adjacent to the sugarcane plots: in the center of the field, at the edge of the field and in the off-crop area outside the field. Pollinators were monitored at cut sugarcane stems along transects, at marked spots, in bee bowls and sugar traps. It was verified that sugarcane fields are directly visited after harvest by a number of hymenopteran pollinator species. However, abundances of most taxa were very low. Aps
The highest concentration of the metal may be characteristic of the geological composition to the soil at that location. T. domingensis can be used as an indicator of potential environmental contamination by bioaccumulation, from the fact that the highest concentrations found in the soil were reflected in plants, particularly in the roots.

RP097. Application tests with PLHC-1 in historical study of soil pollution of urban lake sediments in southern Brazil

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Sediments represent a reservoir for anthropogenic pollutants in aquatic environments may cause adverse effects to organisms. For a complete evaluation of the toxicity of sediments, the use of bioassays in vitro reflect an estimate of the biological activity of pollutants in environmental samples, bioaccumulation, endocrine, and others. The interactions of chemicals with the biota occur at the cellular level, bringing cellular responses to a first manifestation of toxicity. Fish hepatocytes are often chosen for evaluating the toxicity of sediment aquatic environments. Tests with permanent cell lines derived from fish Poeciliopsis lucida are established, known as PLHC-1, one example is the use of hepatocellular carcinoma demonstrated to support metabolic activity and for containing an active aryl hydrocarbon receptor (AhR). This cell line has the capacity to induce the expression of CYP1A after exposure to environmental pollutants such as dioxin-like compounds, pharmaceuticals and extracts of environmental matrices i.e. sediments. This study aimed to get the PLHC-1 response in the presence of environmental contaminants at different concentrations in sediment samples of an urban lake in southern Brazil, in order to obtain information about the historical pollution of the environment. Cells were exposed to various concentrations of sediment extracts (0.1-60 mg EqC/mL) in order to establish dose-response curves for EROD activity was expressed as pmol of resorufin formed per minute and per milligram of protein. In an analysis with samples between the years 1988-2005, the results showed that from the year 1966 was no evidence of cell toxicity response of 60mg/ml of sediment and from 1987 to 2005 in pellet containing the environmental matrices concentrations of 30mg/ml also showed changes in the CYP1A enzyme activity.

RP098. Assessing wettability by a quantitative approach: a proposal for an indicator of soil physical stability with different fertilization treatments

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Soil wettability plays usually a significant role in processes like aggregation and water distribution. Since wettability is related to the presence of organic materials, this variable can be considered as a potential indicator of physical stability of soil in relation to fertilization treatments. In this research, two methodological approaches of a quantitative method (Wilhelmy Plate, WP) assessing wettability (i.e. contact angle) are evaluated. WP was applied to samples from a volcanic soil with establishment of Lolium perenne under different fertilization treatments (i.e. urea and superphosphate) (N: 48, 16 treatments with 3 replicates). The goal of this research was to determine consistency of results between the two WP approaches as also between WP and fertilization treatments. It was observed that all samples were located in the subcritical range of repellency, with the highest CA value =80.6°. Both methodological WP approaches showed a moderate-high correlation (R2 0.75 - 0.81). Correlation between WP and fertilization level was moderate-high (R2 of 0.65 - 0.83), confirming that both WP approaches could be considered as reliable for CA determination. It is concluded that while wettability evaluated by WP and fertilization can be related in order to define an indicator of soil physical stability based on CA, other factors related to soil properties could also be involved for influence CA results. Future experiments will focus on other physical properties, such as texture and infiltration rate.

RP099. Assessment of biomarker parameters in Prochloridium lineatus collected in Reconquista River and their recovery under controlled conditions

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Reconquista River is one of the most polluted rivers in Argentina that receives considerable amounts of urban and industrial wastes. In this study, biomarker parameters of P. lineatus collected in the upper part of the river were evaluated. A significant correlation was found in the concentration of metals in the soil and the species. The species showed a direct relationship between chromium concentration in roots and soil. The correlation coefficient was higher for chromium concentration in roots and soil (R2 0.75 - 0.81). The concentrations of metals in the species were higher in the same range than in the rhizomes and leaves, showing the relationship between high concentration of metal in the soil and roots. The population of Caraá showed a direct relationship between chromium concentration in roots and soil.
parameters were evaluated in gills and liver of juveniles of a native species (Prochilodus lineatus) collected at the mouth of Reconquista River (RR) and Guayracu stream (AG) as reference site. Besides, the recovery capacity of these parameters was evaluated in fish taken from the river and transferred to non chlorinated water and kept under laboratory conditions during 20 days (Re). Fish were weighed, anesthetized, sacrificed and then liver and gills were removed. Condition factor (CF), Liver Somatic Index (LSI) were calculated, enzymatic activity of Glutathione-S-transferase (GST) and catalase (CAT) were determined as well as levels of lipid peroxidation (TBARS) and antioxidant capacity against peroxides (ACAP). The expression of CYP1A protein was evaluated in liver by Western Blot. Data were analyzed with ANOVA or Kruskal Wallis using multiple comparisons procedures, Tukey or Dunnet, when appropriate. There were no significant differences in CF whereas in LSI an increase respect AG was detected in RR (65%) and Re (27%). In both liver and gills, CAT activity decreased significantly in RR comparing to AG (50% and 37%) and Re (40% and 34%). GST activity was not modified in liver but in gills increased 2.5 times in RR respect to AG, showing in Re a recovery in this parameter. In liver TBARS levels were increased in RR but this increment was only significant respect AG in Re fish (43%). In gills the same trend was observed, RR increased 1.5 times and Re 2.5 times in respect to AG while Re increased 63% over RR. No significant differences in ACAP were found in both organs. A strong reactive band corresponding to CYP1A was observed in RR, less reactive bands were observed in Re and AG. These results show that pollutants present in Reconquista River promoted mainly biotransformation responses by means of the expression of CYP1A in liver and the increase in GST activity in gills. Trends in the assessed biomarker parameters were similar in liver and gills particularly in antioxidant enzymes level and oxidative damage in lipids.

**RP100. Bioaccumulation of metals and liver damage in the estuarine fish *Atherinella brasiliensis* from Guaratuba bay (Southern Brazil)**

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The Guaratuba bay is considered moderately impacted and is affected mainly by the agricultural development, domestic sewage and hydrologic modifications from the dam constructions. This region has the largest banana plantation of southern Brazil and a large area of rice planting, which directly influence the quality of the water due to input of organic matter and contamination by metals. Atherinella brasiliensis (Brazilian silverside) is a typical estuarine resident species, also described as one of the most abundant fish in shallow estuarine areas of South Brazil. This species has been frequently used as biodicator in environmental monitoring studies. The aim of this study was to evaluate the bioaccumulation of metals in the liver and muscle and liver damage measured through a multitude of biomarkers in the estuarine fish A. brasiliensis. The specimens were sampled in two points of the Guaratuba bay during the summer (February/2012) and the winter (August/2012). Genotoxicity was observed through the Comet Assay, and DNA Diffusion Assay; metabolic unbalances through the Ethoxysresorufin O-deethylase and Gluthathione S-transferase activities; and morphological disorders through observing histopathological damages (Bernet index). It was observed a significant difference between seasons for the interaction of all biomarkers in the liver test. Principal Component Analysis (PCA) based on biomarkers in the liver was performed in order to acquire a unified view of the biological responses for each species. Data was explained until the second component, where the first component accounted for 50% of the variability and the second for 25%. The relationship between seasonality and biomarkers showed that the upper points of the bay featured larger variation. Data showed that the area is affected by the presence of metals causing adverse health effects of the studied species. Biomarkers also suggest that the xenobiotic uptake in these sites has possibly being related to plantations and human occupations around the Guaratuba bay. The metal contamination was also evident, with arsenic and mercury found mainly in the liver of A. brasiliensis. The presence of these metals may be related to the liver damage.

**RP101. Biochemical responses to metal contamination in situ in the fiddler crab *Uca rapax* (Ocyopidae, brachyura) from differently polluted areas**

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*Uca rapax*, a typical inhabitant of mangroves and intertidal zones, responds to environmental contamination through biochemical adjustments. We assess contamination in metal contaminated areas: urban sediments, rice fields, and the agricultural development, domestic sewage and hydrologic modifications. This species have been frequently used as bioindicator in the environmental monitoring of South Brazil. This species have been frequently used as bioindicator in environmental monitoring of South Brazil. To assess the impact of contaminants in *Uca rapax* we evaluated the response of enzymes, including glutathione S-transferase (GST) and catalase (CAT) to metal exposure. We sampled *U. rapax* from three localities in São Paulo State, Brazil, showing different degrees of environmental contamination. From the toxic to least contaminated, these localities were: Ila Diana, Santos (ID), Rio Itapanhau, Bertioga (RI) and Núcleo Picinguaba, Ubatuba (NP). Metal content was measured in burrow sediments and in the gills and hepatopancreas. For metal and biochemical analyses, crabs were dissected immediately after collection and the gills and hepatopancreas were stored at -80°C until analysis. The metals measured in the burrow sediments were below the toxic effect limit for all locations. Metal concentrations in both tissues were inaccipent to moderate in crabs from all three locations, although higher in ID and RI for both seasons. Metallothionein-like protein was induced in crabs from the more contaminated sites (ID and RI) in both seasons, showing that the crabs detoxify metals. Activities of GPX, GST and ACHE were altered in NP during summer, and in ID and RI in winter. Enzyme activation in crabs from NP during summer also may have been induced by abiotic factors like temperature and precipitation in crabs from ID and RI in winter, responses more likely reflect metal contamination. Metal concentrations measured were below the toxic effect limit for all localities in sediment, however the concentration of metals in tissues was higher than in sediment. Crabs from ID and RI showed high concentrations of metals in their tissues, as compared to crabs from NP. The biomarkers evaluated here provide a clear indication of metabolic effects in *Uca rapax* exposed to chronic metal contamination in situ.

**RP102. Calibrating the uptake of hydrophobic chemicals with ethylene vinyl acetate (EVA) polymer: A thin-film passive sampler in water**

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Over the last decade, passive sampler devices (PSDs) have been used as a water monitoring tool for many hydrophobic chemicals (log Kow >3), integrating spatial and temporal information. An alternative of PSDs has been the use of ethylene vinyl acetate (EVA) polymer. This study aims to calibrate the EVA passive sampler for 9 different hydrophobic chemicals, such as trifluralin (Tri), alpha-hexachlorocyclohexane (α-HCH), hexachlorobenzene (HCB), tetrachlorovarotrol (TeCv); pentachloronisole (PCA), lindane (γ-HCH), pentachloronitrobenzene (PCNB), aldrin (Ald) and cypermethrin (Cyp), through a static exposure design (EED). Firstly, spiked EVA polymer was added in a glass jar bottom until equilibrium in water was reached, then glass fiber filters coated with EVA (EVA sampler of 34 cm2) were immersed in contaminated water in order to estimate the partition coefficient between the EVA sampler and water (Keva-w) for each chemical. Also, the sampling rates (Rs) and elimination rate constants (ke) in the EVA sampler were determined. Results show that a thin-film (5–7 μm) of EVA sampler can reach rapid equilibrium in a short time of exposure (27 hours) in laboratory conditions, where the log Keva-wobtained in EED showed a good correlation with octanol-water partition constants (Kows, log Keva-w= 0.825 log Kow + 0.746; R2=0.661), previously reported for each hydrophobic chemicals selected. The Rs and ke ranged between 0.003-0.022 L min-1 and 0.001-0.004 min-1, respectively. If we consider these uptake parameters with the EVA sampler we can estimate the time required to reach equilibrium in field. However, a deployment of 27 hours (~1 day) could reach equilibrium lower than 10% for Tri, α-HCH, HCB, TeCv, PCA, γ-HCH and PCNB. In contrast, other hydrophobic chemicals such as Cyp and Ald could reach an equilibrium of 22% and 57%, respectively. This is due to infinitely large water volume in the field. In conclusion, this EED system can be a useful approach to determine the uptake rate of hydrophobic contaminants for the EVA sampler, resulting in an estimation of chemical water concentration in the field. On the other hand, EVA polymer was chains and robust samplers, with fast equilibration times and simplified laboratory analyzes.

**RP103. Could the intensive pesticide use be a major factor for bee fauna reduction in agricultural and preserved areas in Brazil?**

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Pollination is an essential ecosystem service for food production and for the maintenance of biodiversity in natural areas. Studies have shown that insects, especially bees, are the main agents responsible for pollination of many wild and cultivated plant species. In this context, agricultural landscapes should be able to maintain pollinators, providing suitable conditions for their nesting, survival and reproduction. In this study, we collected bees from flowers of the orange orchards surrounding the Mogi Guacu Biological Reserve and from native species of trees and shrubs, between 2011 and 2013. Such bee specimens were collected near the edge reserve/orchard as well as on the first orange tree row in the plantation, about 10 m from the edge. The orchard management is conventional with pesticide application. We analyzed such data to compare the bee fauna in both areas and to discuss the contribution of the native area as a source of bee pollinators to the orchards surrounding it. We observed 58 species of insects on the Biological Reserve, including 51 (71%) species of bees from 2 families (Apidae and Halictidae), 14 (21%) of flies (Syrphidae, Tachinidae and Scoliidae), 4 (6%) of wasps, 2 (3%) of beetles and 1 (1%) of butterfly. The social species observed were mainly Apis mellifera, stingless bees (Meliponini) and Bombus (Ferдобovombus) morio. Among the solitary bees, the common species were from the subfamilies Coletini and Tetrapredini (Apidae) and Exomalopini (Colletidae). The orchards, only from eight species were collected. The most frequent visitors were A. mellifera, Tetrapredini and Trigona angustula and Trigona spinipes. Two other species of stingless bees (Meliponini), 2 species of Halictidae and 1 species of Coletidae were also observed. However, the number of visitors of species on the biological reserve as well as on orchards was longer than that found in other studies in South America. Moreover, native species/genus collected in the reserve and previously referred as Citrus flower visitors were not observed on the orchards. This may be a consequence of the intensive use of agrochemicals on the orchards reported by local farmers. Our findings showed morphological changes consistent with pesticide poisoning in A. mellifera collected from both areas. Nevertheless, further studies will be required to clarify the role of intensive pesticide use in the region for the conservation of bees and the environmental services provided by them.

**RP104. Diseño de un sistema de evaluación biológica de disruptores endocinicos. Caso: pesticidas en el Lago de Tota (Boyacá, Colombia)**

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El Lago de Tota (Boyacá, Colombia) es uno de los ecosistemas de alta montaña más importantes en la cordillera oriental colombiana, por su amplio volumen de agua acumulada y porque históricamente ha sido receptor permanente de diversos contaminantes que se utilizan en la cuenca del río Tota. Estos contaminantes, principalmente pesticidas para la protección de la biota acuática, pueden afectar a las especies endémicas y a los ecosistemas acuáticos. El objetivo de este estudio fue analizar el impacto de los pesticidas en el Lago de Tota, identificando las especies más afectadas y las áreas más vulnerables. Se analizaron muestras de agua, suelo, cascarilla de maíz y material particulado sedimentable (MPS). Se realizaron muestreos mensuales durante un año, se midieron los microcontaminantes inorgánicos (Cr, Pb y Cu) y se determinaron los niveles de pesticidas.

**RP105. Distribución de plaguicidas en ambientes rurales con conflictos socioambientales: caso Monte Maíz, Córdoba, Argentina**

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A raíz de la solicitud realizada por vectores organizados en la Red de prevención de Monte Maíz, en octubre del 2014 se llevó a cabo una evaluación de la situación sanitaria ambiental de dicha localidad. La preocupación de los pobladores radica en el aparato de número de personas afectadas por enfermedades graves y su posible relación con el uso de agroquímicos en la zona. El estudio fue realizado en el marco de un censo epidemiológico, un análisis del entorno socioambiental y un estudio de niveles de concentración de plaguicidas en muestras ambientales. Participaron del mismo, personal del Municipio y vecinos de la localidad en conflicto profesionales y estudiantes de la Facultades de Medicina y Humanidades (UNC) y Ciencias Exactas (UNLP). El objetivo del presente trabajo es comunicar los resultados del monitoreo ambiental de plaguicidas realizado en el marco del Campamento Sanitario 2014. Se tomaron muestras de agua, suelo, cascarrilla de maíz y material particulado sedimentable (MPS). Se muestrearon 12 sitios a lo largo de la ciudad y en la periferia cercana. La selección de los mismos se coordinó entre el equipo de trabajo y los vecinos. Se analizaron 9 plaguicidas de relevancia agrícola actual. Las determinaciones de insecticidas con función enzimática fueron realizadas por COI-ECOD-MS, previa extracción de las muestras de agua según el Método 3500C USEPA y suelos por dispersión de matriz en fase sólida (MSPD). La determinación de herbicidas se realizó por extracción con solventes activos seguido de análisis por HPLC-MS. Los resultados muestran una presencia generalizada y variable en las concentraciones detectadas. Los plaguicidas con mayor predominio de detección (>65%) son Clorpirifos y Endosulfán. El comportamiento más afectado fue el suelo, siendo el Gifosato y AMPA los compuestos más relevantes en dicha matriz, con niveles mayores en espacios públicos y de almacenaje de agroquímicos, respecto a zonas de cultivo. Las concentraciones detectadas en el agua de red indican que es apta para consumo humano. Se realizarán futuros estudios para alcanzar una caracterización más detallada de la problemática y de esta manera contribuir con conocimiento necesario que genere herramientas de intervención en la mejora de la calidad de vida de la población.

**RP106. El zooplankton como bioindicador de contaminación en arroyos de la provincia de Santa Fe (Argentina)**


En el presente trabajo se estudió comparativamente la diversidad de la comunidad zooplanctónica del Sistema de Arroyos Colastín-Coralito (Santa Fe, Argentina) con concentaciones de plaguicidas (Atrazina -Atr- y Endosulfán -End-) y microcontaminantes inorgánicos (Cr, Cu, Pb y As) registrados en agua y sedimento. Se realizaron muestras mensuales durante un año, se midieron variables físicas y químicas y se determinaron concentraciones de metales pesados, As y plaguicidas en agua y sedimento. Se analizó la relación entre el zooplancton y las concentraciones de contaminantes en ambas matrices y la estructura de la comunidad zooplanctónica. En ciertas oportunidades, los valores de Cr, Pb y Cu registrados en agua superaron los niveles guías propuestos para la protección de la biota acuática (el Cr los superó al 81% en el periodo 2011 – 2013. El proyecto busca diseñar un sistema de evaluación biológica de disruptores endocinicos (DE) presentes en agua y sedimentos del lago, se propone revisar literatura especializada sobre métodos biológicos de detección de disruptores endocinicos en estas matrices ambientales, verificar si cuatro de los fungicidas detectados en el agua de afluentes del lago (malatión, tebuconazol, difenoxaoxol y cloroalato), pueden presentar esta propiedad de DE, ya que algunos pesticidas se consideran como los principales disruptores endocinicos junto con los medicamentos humanos y veterinarios presentes en cuerpos de agua. Se verificará además si esos fungicidas podrían afectar organismos acuáticos no blancos presentes en el lago, información clave a tener en cuenta al momento de diseñar el sistema de evaluación, se espera que en el largo plazo contar con herramientas objetivas y altamente sensibles para alertar sobre potenciales efectos tóxicos por xenobióticos que deben ser vigilados para garantizar la calidad funcional y ambiental del lago. Estos trabajos liderados por la universidad pública deben contribuir con la toma de decisiones de gestión del agua en la cuenca y fomentar la preservación, conservación y uso racional, así como también visibilizar el nivel de riesgo por el uso de agroquímicos en la zona y alertar sobre los posibles conflictos de uso de esta fuente en procesos de potabilización.
1. Los resultados proporcionaron información sobre la relevancia de considerar los efectos de contaminantes registrados en sistemas acuáticos regionales sobre la estructura de una comunidad clave para el mantenimiento de la salud ecosistémica.

**RP107. Elemental composition of the bioindicator Parmotrema austrosinense transplanted to the city of Malargüe (Mendoza, Argentina)**


Los lichen Parmotrema austrosinense (Zahlf.) Hale fue usado como una bioindicadora de calidad del aire en la ciudad de Malargüe (Mendoza, Argentina), para determinar la influencia de las emisiones contaminantes presentes en la ciudad. Los resultados fueron determinados mediante análisis de tests de control. Se encontró que los contaminantes se distribuyen en diferentes áreas de la ciudad, lo que sugiere la necesidad de una vigilancia estricta de la calidad del aire en esta región.

**RP108. Estrategia experimental para evaluación de riesgo ecotoxicológico en organismos bioindicadores de la bahía de Concepción, Chile**

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La Bahía de Concepción se encuentra en la Región del Biobío, Chile Central y tiene un rol fundamental en la sostenibilidad del desarrollo socioeconómico y cultural de la región. Se encuentra rodeada de zonas urbanizadas y industrializadas, que actúan como fuentes de contaminación. En esta investigación, se realizó un análisis de la distribución de contaminantes químicos en diferentes áreas de la bahía, utilizando técnicas de análisis químico y biológico. Se realizaron análisis de controles y la comparación fue realizada con la media de la contaminación en zonas limpias.

**RP109. Estrogenicidad e intersexo en juveniles de trucha arcoíris (Oncorhyncus mykiss) expuestos a efluentes de Pino/Eucalyptus en Chile**

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Los efectos reproductivos en peces a causa de los efluentes de plantas de celulosa en Chile han sido asociados con un incremento en el tamaño gonadal, maduración sexual temprana y disrupción hormonal tanto en peces nativos como exóticos. Trabajos previos se han enfocado en la exposición directa al efluente o en la evaluación de poblaciones naturales aguas abajo de la descarga de los efluentes de plantas de celulosa. En el presente trabajo, los efectos de los efluentes de celulosa en trucha arcoíris (Oncorhynchus mykiss) se estudiaron usando dos estrategias (1) exposición controlada en laboratorio a efluentes terciarios de producción de celulosa desde Eucalyptus globulus y Pinus radiata; y (2) bioensayo en situ aguas abajo de la descarga combinada de la misma planta de celulosa. Evaluamos respuestas reproductivas (vitelogénum plasmático (VGT), desarrollo gonadal) y metabólicos (actividad Etoxyresorufina-O-desielatasa (EROD), tamaño relativo del higado (IHS), así como el factor de condición (K) de juveniles truchas arcoíris, hembras y machos. A pesar del incremento promedio en el índice gonadosomático (IGS) en peces expuestos, no se observó una diferencia significativa en el tamaño gonadal relativo entre individuos expuestos y control. A pesar de esta falta de diferencias significativas tanto en volumen y peso corporal como en el peso de los órganos y en las respuestas evolutivas de los efluentes, se observó una concentración significativamente mayor de VGT plasmática, especialmente en los peces expuestos a los efluentes de Eucalyptus. Por otra parte, los machos mostraron varias características de intersexo en ambos ensayos con efluentes directos y, a pesar de la baja concentración de efluentes en el río (< 1% [v/v]), se observaron respuestas similares en los peces expuestos a los efluentes. Finalmente, la actividad EROD fue inducida en los peces expuestos a exposición controlada y a campo. Este estudio confirma los efectos estrógenicos en peces machos expuestos a efluentes de celulosa en Chile.
RP111. Extraction parameters in the toxicity and genotoxicity assessment of sediment samples from a highly polluted river basin

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Many areas of Latin America have been affected by the intensive use of natural resources and by the release of wastes without an adequate treatment. The pollutants generated by human activities reach surface waters and are deposited in sediments. The aim of this study was to investigate the chemical extraction efficiency associated with the detection of toxicity and genotoxicity in sediment samples extracts. In order to evaluate the extraction efficiency of inorganic and organic toxicants, the chemical analysis of metals and polyyclic aromatic hydrocarbons (PAHs) along with a battery of four bioassays was performed. The organic compounds were extracted by sonication in methanol and dichloromethane. The inorganic compounds were extracted by sonication and shaking in acidic solution (pH 4.5 ± 0.2), and shaking in distilled water (pH 5.5 ± 0.5). The organic extraction methods were compared by quantitative analysis of PAHs using CGMS. The three inorganic extraction methods were compared by quantitative analysis using atomic absorption spectrophotometry. Two toxicity assays were carried out: the algal growth inhibition test using the green algae Pseudokirchneriella subcapitata, and the root elongation inhibition test using Lactuca sativa. Two genotoxic assays were carried out: Salmonella typhimurium assay to detect mutagenicity (with and without metabolic activation), and the Allium cepa test to detect chromosomal alterations. According to the chemical analysis, dichloromethane extracted more but fewer concentrations of PAHs compounds than methanol, and the acidic solution extracted more heavy metals than distilled water. The methanolic organic extracts were toxic to P. subcapitata but were more toxic to L. sativa. The distilled water in shaker extracts were non-toxic to P. subcapitata, but were toxic to L. sativa. The acidic extracts in shaker were more toxic to P. subcapitata than the sonicated, but none of these inorganic extracts were toxic for L. sativa. Mutagenic effects were detected only in the organic dichloromethane extracts in the presence of metabolic activation. All the inorganic and organic extracts were genotoxic to A. cepa. This study showed that the implementation of different extraction methods along with a battery of bioassays could be suitable tools for detecting toxicity and genotoxicity in sediment samples.

RP112. Genotoxic and mutagenic potential of estuarine sediment from three regions of the coast of Espírito Santo, Brazil

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The state of Espírito Santo, in Southeastern Brazil, has a coastal area of approximately 460Km of estuaries and rapids and a population of about 3 million inhabitants, of which 75% are located in urban areas. It has a fishing industry of great importance to the state's economy, being the main source of employment and income in some municipalities as Marataizes, Itaperimirin and Piuma, in the Southern state, and Conceição da Barra in the North. In addition, the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the capital of the state has three major ports, two of them in the metropolitan area of the...
The main Brazilian processing pole of marble and granite is located in the municipality of Cachoeiro de Itapemirim, in the south of Espírito Santo state. This municipality has a population of approximately 207,000 inhabitants and treats 94% of sewage collected. The significant size of its population and the industrial and agricultural activities are the possible sources of aquatic pollution in the region. The seat of the municipality is on the Itapemirim River margin, whose basin covers 687,000 hectares and 17 municipalities. To evaluate the toxic potential of the water of this river, a bioassay was conducted with fishes (Oreochromis niloticus) exposed for seven days with water of four sites along the river. A negative control (NC) group was exposed to dechlorinated tap water for comparison. Sites P1 and P2 were located upstream of the seat of the municipality while sites P3 and P4 were downstream. At the end of the experiment, the fishes were sacrificed and their gills subjected to histological routine. Histological changes were quantified and multiplied by an importance factor (IF): IF-1, pathological changes of minor importance and easily reversible; IF-2, pathological changes of moderate importance where the lesion can be reversed in most cases; IF-3, hardly reversible lesion even after the end of the exposure. The observed changes were: proliferation of the epithelium of the primary lamella, lamellae fusion, congestion of secondary lamellae, epimieliot, epithelial lifting and aneurysm. The most frequent were: proliferation of the epithelium of the primary lamella (IF-2) and epithelium lifting (IF-2). The statistical analysis demonstrated significant differences between fishes from NC and the other sites being CN (99.04) < P1 (405.14) = P2 (304.27) = P3 (299.06) = P4 (277.50). Although it was not observed significant difference between the sites, the highest mean of changes was observed in fishes exposed to the water of P1, probably due to its proximity to the Pacotuba district that has a population of 4,600 inhabitants and a less efficient sewage treatment (antiseptic tank system). The P2 is near to the confluence of Castelo River and Itapemirim River; this can contribute to the dilution of pollutants. P3 and P4 are downstream the seat of the municipality, and the lowest values of histological changes observed at these sites may be due to the fact that the sewage is treated by a more efficient method, the activated sludge mechanism.

RP116. Investigation of Vibrio spp. in environmental samples from natural brackish water lagoons and shrimp farm ponds in Laguna, Santa Catarina, Brazil.

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Vibrio spp. are ubiquitously distributed in marine and estuarine environments. Vibrios are important for biogeochemical cycling in aquatic environment, being found in sediments and in association with plankton, as components of the aquatic “phycosphere”. Several Vibrio spp. have been found as causative agents of infections in shrimp, as well as in marine and brackish water fish. Due to the high prevalence of these bacteria in aquatic environment and the human consumption of raw or undercooked seafood, infections caused by pathogenic non-cholera vibrios have been increasing worldwide. Monitoring the presence of Vibrio spp. in aquatic environment can contributes to evaluating water quality and assessing environmental risks. We collected phytoplankton and sediment samples from natural brackish lagoons and shrimp ponds in the autumn of 2013 in Laguna, Santa Catarina State, Brazil, and an important region for fishery and shrimp aquaculture. To investigate the presence of Vibrio anguillarum, ToxR gene was target by the polymerase chain reaction. Two phytoplankton samples were positive: one from a natural lagoon and one from a shrimp farm pond. None of the sediment samples was positive. Interaction and dynamic of phytoplankton-bacteria (probiotic or pathogenic bacteria) can be very complex and phytoplankton cells can directly influence the “phycosphere”, along with environmental parameters. Water temperature, water acidification and sources of organic material may interfere with Vibrio abundances and dynamics. In this experiment some phytoplankton diatom species, as Coscinodiscus sp. can favor Vibrio growth, while others, such as Chaetoceros sp. and the macroalgae Ulva clathrata, may inhibit it. The latter are commonly found in the studied area. The absence of V. anguillarum associated with sediment could be due to the warm temperature of water. Sediments are potential Vibrio reservoir, especially in cold temperatures (< 10°C) but water temperature in the sampling area hardly reaches such values. Investigating the occurrence of other Vibrio spp and classifying pathogenic and non-pathogenic serotypes are under progress. Ours findings underscore a favorable “phycosphere” for V. anguillarum in the studied area that may likewise favor other Vibrio spp. The biocomplexity of water microbial ecology and its potential impact on wild and cultivated aquatic species, as well as human health, should not be underestimated.

RP117. Lecanoric acid and soluble proteins as biomarkers in Parmotrema austrosinense transplanted to San Fernando del Valle de Catamarca, Argentina

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The quantification and analysis of new chemical and physiological parameters in lichens used as biomonitors contribute to a better assessment of air quality. This study analyzes the content of lecanoric acid and soluble proteins in Parmotrema austrosinense (Zahlbr.) Hale transplanted to different sites in San Fernando del Valle de Catamarca, with the aim to evaluate the behavior of these compounds as biomarkers of air quality. Thalli were collected in a shortly anthropized area and transplanted in bags to 18 sites in the city. After three months, lecanoric acid and soluble proteins were quantified. In addition, chlorophylls, phaeophythin, malondialdehyde and sulfur content were analyzed in order to calculate a Pollution Index (P.I.). The sampling points were grouped in three categories, which were arranged according to increasing P.I. values. Lecanoric acid and soluble proteins showed significantly higher content in lichens transplanted to sites with low P.I. values (ANOVA, p < 0.001). In agreement with these results, P.I. correlated negatively with soluble proteins (r = -0.5472) and lecanoric acid content (r = -0.6501), while these compounds were positively correlated (r = 0.6602; p < 0.001, Pearson’s Correlation). Therefore it is inferred that lecanoric acid and soluble proteins are compounds that can be used as biomarkers of urban air quality in P. austrosinense.

RP118. Marcadores fisiológicos en especies del género Punctelia en las cuencas de los arroyos Potreros y Vis-Vis, Andalgalá (Argentina) (Argentine)

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Liquenes del género Punctelia fueron muestreadas en el área del complejo volcánico Paralón Negro, con el fin de obtener datos ecológicos y químicos de este género que luego será evaluado como posible biomonitor de calidad de aire en el área minera. Para ello se tomaron muestras en dos cuencas (arroyo Potreros y arroyo Vis-Vis), en sitios con distinta altitud y a partir de dos tipos de sustratos. En los talos se analizó el contenido de pigmentos fotosintéticos (clorofílas, fotorfinas y carotenoïdes) y polifenoles solubles totales, que son parámetros utilizados como biomarcadores de calidad ambiental en liquenes. Punctelia es un género de hongos lixinizados frecuentes en esta región. Los especímenes de Punctelia propuestos se utilizan como biomarcadores de calidad de aire. En el presente trabajo se determinan los parámetros de calidad ambiental en las cuencas Potreros y Vis-Vis, y se analizan las diferencias significativas entre sitios para ambas cuencas, los cuales responden a parámetros ecológicos como sustrato, altura y exposición a la radiación solar. Los pigmentos fotosintéticos correlacionan negativamente con polifenoles solubles totales. De los parámetros analizados, clorofílas a, clorofila total, fotobionta y fotobionta total son los que mejor explican la variabilidad de los datos. Estos serán, por tanto, parámetros de elección para realizar futuros estudios de Punctelia como bioindicador. No obstante, dado que estos parámetros responden a diversas variables ambientales, las mismas deberán tenerse en cuenta al ajustar el diseño muestral cuando se esté realizando la evaluación de este género a calidad de aire en el área minera.

RP119. Molecular responses in oysters Crassostrea braziliensis exposed to impacted waters of balneario Camboriú bay, Brazil

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The aquaculture of marine mollusks sometimes takes place in the vicinity of urban areas. This is the situation found in the city of Balneário Camború (Santa
Catarina, Brazil), where tourism represents a main economic activity. In the summer, the city population reaches almost nine times the average registered during the other seasons of the year. This scenario promotes a considerable anthropogenic impact with the increase of sanitary sewage discharges. The aim of this study was to evaluate the potential changes in 28S, 40S-S3, CAT, GPX, SOD, ALAD, CYP4502AU1, GSTU, SULT, HP70 and FABPgene transcript levels in gills of Crassostrea brasiliana exposed for 24 hours, under laboratory conditions, to water collected from different sites in Balneário Camboriú Bay (BCB): LAR and BAR (aquaculture areas), CAM (river mouth), MAR (runoff channel), TAQ (TAQ – beach; reference site). Further, a group of C. brasiliensis was simultaneously exposed to filtered sea water from an aquaculture hatchery facility (LCM). Real time qPCR was used to evaluate the transcript levels of the ten genes. GPX, SOD and FABP transcript levels were higher in MAR whereas ALAD and HSP70 were higher in CAM. The transcript levels of CAT, CYP4502AU1, GSTU and SULT genes revealed no differences among sites. These findings suggest a potential reduct imbalance promoted by MAR water probably caused by sanitary sewage contaminants. Additionally, the higher levels FABP transcript suggest a tentative lipid mobilization to supply energy for biotransformation and/or the presence of PPAR agonists in water. Moreover, the water quality showed higher levels of coliforms in MAR and CAM, indicating sanitary sewage impact. Chemical analysis of sediments showed 2HPCAs, 2PCBs and 2LLAs to be higher in CAM, as well as fecal steroids (cholesterol and coprostanol). Overall, the results indicate the vulnerability of BCB to anthropogenic impact. Analyses of molecular biomarkers, such as those pointed out by our results, may contribute to a periodic and effective biomonitoring of this aquatic environment in order to demand local policies to safeguard oyster farming as a viable economic activity for local communities. Keywords: biomarkers, Crassostrea brasiliensis. Funding: INCT–TACNPq in Passive sampling devices (PSDs) are an efficient technique for time-integrated monitoring of dissolved contaminants. To calibrate the sampling rates, most laboratory experiments utilize distilled water, thus simplifying the partition process occurring in natural waters which contain competitive phase such as dissolved organic carbon (DOC) and suspended particles (SPM). In this work we compare the sampling rates of hydrophobic compounds (aliphatic hydrocarbons: PAHs, PCBs, chlorinated pesticides: POCI and metals (Cu and Mn) of a PSD exposed to distilled water (DIS) and Rio de la Plata water (RLP) and examine the analyte’s behavior considering their physical chemical properties. PSDs consisting of hydrophobic organic (C18, 3M) and metal membranes (chelating, 3M) covered with diffusion membranes (polyethylene 6.4 Å and ethyl cellulose 45 μm) were exposed in a 28 l tank with continuous flow (0.5 l.h-1) connected to a 400 l reservoir and to a peristaltic dosing pump (1.6 m.h-1; 100 ng.l-1; metals: 100 ug.l-1). Four PSDs rotated at 32 rpm (0.5 m.s-1) were exposed to DIS (Cond: 33.3±11 mS; pH: 8.2±0.7 mg.l-1; pH 7.2±0.1) and RLP (Cond: 304.4±47 mS; pH: 6.7±1.4 mg.l-1; pH: 7.6±1.1; SPM: 39.2 mg.l-1; DOC: 12.7 mg.l-1) and removed at 3, 7, 15 and 30 days to evaluate sampling kinetics, with parallel collection of water for contaminant analysis. Determinations were performed by GC-FID-EC previous extraction with ethyl acetate and dichloromethane (organics) and by atomic absorption spectrometry previous extraction with nitric acid (metals). Results indicated sampling rates 1-27 times higher for DIS relative to RLP (0.05-1.73 vs. 0.002-3.9 d.l-1) reflecting direct partition from the water to the membranes without competition of DOC and SPM. The difference maximized for metals (9-27 times) and for highly hydrophobic (> log Kow) organics, i.e. ALI (5.4-18 times; logKOW: 8.3) followed by PAHs (8.3 times; logKOW: 5.2); POCI (3.7-7.1 times; logKOW: 5.4) and PCBs (1-3.5 times; logKOW: 6.0).Sampling rates of individual compounds showed a parabolic pattern relative to logKow similar to the biocorrelation concentration, maximizing at log Kow 5.0-6.4 (0.14-1.73 DIS and 0.08-0.39 d.l-1 RLP), with lower rates for less hydrophobic compounds (Kow 4) and even lower for superhydrophobic ALI (logKow>7.7) due to diffusion steric hindrance related to maximum molecular lengths (21±0.1 Å).

**RP120. Monitoring of pesticides in zones with different type of agricultural production**

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In Argentina they realize cultivos extensivos e intensivos de amplia variedad. Esta producción, mayormente está basada en la demanda de insumos químicos, siendo los plaguicidas uno de los productos que le dan sustento. El objetivo del presente trabajo fue cuantificar distintas familias de plaguicidas (insecticidas, herbicidas y fungicidas) en ambientes representativos de la región pampeana, considerando regiones de producción exclusivamente extensiva de soya y maíz y zonas mixtas hortícolas y extensivas. Se muestrearon en períodos de altas y bajas intensidades de uso, con el fin de conocer las diferencias significativas entre las distintas zonas. En sitios con prevalencia de agua salobre se detectó alglifosato (sóloni 400 µg Kg-1); en sitios con prevalencia de agua dulce se detectó efitropuro, metolachlor (sóloni 400 µg Kga-1). Los resultados indican una frecuencia de aparición, en aguas superficiales, > al 90% para clorpirifos y > al 50% para endosulfan, con concentraciones en un intervalo de 0.001-2.5 µg l-1 y 0.001-0.9 µg l-1 respectivamente. El glifosato solo se detectó en el 10% de las muestras acuosas con rango 0.2-2 µg l-1. Para los sedimentos, el compuesto más frecuentemente detectado fue el glifosato y su metabolito AMPA (max. 400 µg Kg-1) sin diferencias significativas entre las distintas zonas. En sitios con prevalencia de actividad hortícola además se detectaron distintos herbicidas como atrazaín y acetoclor, así como una alta frecuencia de detección del fungicida epoxiconazol y el organoclorado pp'-DDT. Estos resultados evidencian el ingreso de plaguicidas a los cuerpos de aguas superficiales y su potencial impacto sobre los ecosistemas.
samples; and application of a rapid assessment protocol. Samples were collected from surface water at two sites in October 2014 for the analyses of the following parameters: dissolved oxygen, caffeine, total e thermal tolerant coliforms, chlorides, temperature and conductivity, besides the use of a rapid assessment protocol for characterization of the ecological status of the sampling sites. In spite of both sites were located in impacted areas, all indicators analyzed were within the reference values established by the Brazilian legislation.

**RP124. Presence of BDE-209 in sediments and biota estruaria of the Laguna Costera Mar Chiquita, Provincia de Buenos Aires.**

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The evaluation of the retardador de llama aditivo BDE-209 in ecosistemas costeros, cobra gran importancia debido a su relevancia ambiental. Su relación con la presencia de desechos domésticos e industriales, su alta lipofilicidad y la creciente documentación de efectos adversos, hacen necesaria su evaluación en matrices ambientales de importancia. Se analizaron sedimentos y tejidos del polígono de estudio (Laguna Costera Mar Chiquita (índividuos completos) y el cangrejo Cyrtograpsus angulatus (branquias, hepatopáncreas y músculo) provenientes de laguna costera Mar Chiquita (37° 44’ 27” S; 57° 25’ 30” W). Los análisis de BDE-209 se llevaron a cabo mediante GC/MS operado en modo SIM e Ionización Química Negativa (NCI), utilizando 13C12-BDE-209 como estándar interno. Los niveles de BDE-209 en sedimentos de arena-fango mostraron valores de 1.5-6-4.27 ng/g p.s., mientras que L. acuta arrojó valores de 14.1-4.41 ng/g p.h. En tanto en el cangrejo C. angulatus se observaron valores diferentes según tejido, presentando las branquias las mayores concentraciones (22.9-0.9 ng/g p.h.), seguido de músculo (19.3-38.2 ng/g p.h.) y hepatopáncreas (2.1-38.8 ng/g p.h.). Asimismo los niveles de BDE-209 en tejido C. angulatus mostraron una importante variabilidad estacional primavera-verano, observándose un decremento de un 60, 50 y 80% de BDE-209 en branquias, hepatopáncreas y músculo respectivamente. Los resultados obtenidos muestran la presencia de BDE-209 en ecosistemas de alto valor ecológico, siendo asimismo el primer reporte de la presencia de BDE-209 en zonas estruarias de la costa Argentina. Igualmente se aprecia el potencial de bioacumulación de las especies bentónicas estudiadas, lo que sugiere que compuestos altamente bromados (decabromado) se encuentran igualmente biodisponibles en tramas tróficas estuarinas.

**RP125. Residues of Environmental Pollutants in Muscle of Commercial Fish of the “Río Uruguay”**

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One goal of the CARU is to ensure the health of the aquatic resources of the “Río Uruguay” and particularly to screen the residue level of pollutants in fish. The data from the 2013 and 2014 surveys are presented in this study. Samples from 5 fish species (Prochilodus lineatus, Salminus brasiliensis, Leporinus obtusidens, Luciopimelodus pati and Hoplias malabaricus) were collected in twelve locations divided in three sectors (lower, middle and upper) along the common sector of the “Río Uruguay” among Argentina and Uruguay during two campaigns per year. Fish samples of the same species and location were pooled. A total of 107 pools were analyzed for PCBs, PBDEs, organochlorine (OC), organophosphorus (OP), carbamate (CA), pyrethroids (PY) pesticides, as well as other new generation insecticides, herbicides and fungicides. In addition, heavy metals were also analyzed. Chemical analyses were performed by recognized laboratories of National Universities of Official Laboratories of Argentina and Uruguay under standardized methods. Maximum and average concentration total PCBs were 4.1 and 1.2±0.2µg/Kg, confirming the decreasing trend from 2006. No relationships with the fish species or the river sector were observed. Maximum and average total PBDEs were 17.5 and 5.0±0.2µg/Kg. Maximum and average total OCs were 175.5 and 28.0±7.7µg/Kg, with α and β-endosulfan as the major contributors. Maximum and average total OPs were 30.8 and 2.8±1.2µg/Kg, mainly as chlorpyrifos and diazinon. CA and other insecticides were not detected. Among herbicides, atricome, atrazine and clomazone were detected 3.0, 0.6 and 0.4µg/Kg maximum, respectively. Detected fungicides were tebuconazole and pirimicarb with maximum concentrations of 0.4 and 0.2µg/Kg. Of the analyzed heavy metals, Cd and Pb were not detected and maximum concentration of total Cr was 0.5mg/Kg. On the other hand, average concentration total Hg were 0.64±0.1mg/Kg. A clear relationship among the species trophic level and total Hg concentration was found. In general, residue levels were low, regarding international regulations, but more detailed studies are needed regarding Hg levels in S. brasiliensis.

**RP126. Seasonal and spatial variations of glyphosate residues in surface waters of El Crespo stream, Buenos Aires province, Argentina.**

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El Crespo stream is located inside a small watershed (52,000 Ha) which is mainly influenced by farming activities without urban or industrial impact. The watershed can be divided in two areas, the southern area (upstream), mainly composed of intensive crops and the northern area (downstream) used only for extensive livestock. In this sense, El Crespo stream is an optimal site for monitoring screening of pesticide residues. The objective of this work was to determine the seasonal and spatial variations of glyphosate (GLY), in surface waters of El Crespo stream. We hypothesized that in surface waters of El Crespo stream the levels of GLY vary depending of the season and rainfall events. The water sampling was carried out from October to June (2014-2015) in two sites: upstream (US) and downstream (DS), before and after rain events. The water samples were collected by triplicate in 1 L polypropylene bottles and stored at 20°C until analysis. GLY was extracted from unfiltered water samples with a buffer solution (100 mMNa2B4O7·10H2O/100 mM K3PO4, pH=9) and derivatized with 9-fluorenylmethylchloroformate (1 mg/mL in acetonitrile). Afterwards samples were analyzed using liquid chromatography coupled to a tandem mass spectrometer (UPLC-MS/MS). The detection limit (LD) was 0.1 mg/L and the quantification limit (QL) was 0.5 mg/L. The rainfall regime was obtained from the database of INTA Balcarce. GLY was detected in 92.3% of the analyzed samples. In the US site, GLY was regularly applied, the highest GLY concentration was registered in October (2.15 ± 0.16 mg/L), from November to December the levels decreased from 1.97 ± 0.17 mg/L. GLY was detected in the DS site, were it had not been applied and the highest concentration was registered in January (1.71 ± 0.13 mg/L). In the remained months the levels varied from 1.06 ± 0.16 mg/L to < L. The GLY residues found in October and November in both sites could be explained by the use of GLY in chemical mulch before the summer season associated to run off sediment transport after heavy rain falls. On the rest of the months, the rainfall events were scarce and the GLY concentrations decreased in both. These results indicated that in the El Crespo stream the GLY residues vary according to the applications in the field and the rainfall regime and the DS site is probably a sump of GLY residues applied upstream in the crop area.

**RP127. Sediment Toxicity Identification Evaluation (TIE - Phases I and II) of Intertidal Water in Coastal Areas Affected by Domestic Sewage**

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Domestic sewage is a major problem in highly urbanized coastal areas worldwide and it has impacts on the economy, human wellbeing and wildlife. The Toxicity Identification Evaluation (TIE) approach combine toxicity assays and simple physical/chemical manipulations on a sample in order to selectively alter the toxicity of specific classes of contaminants suspected to cause toxicity. This is important to aim efforts on sewage treatment strategies that reduce toxicity to local biota and improve environmental quality. At current research, TIE phases I and II were applied in sediment interstitial water (IW) from two locations in São Paulo Coast (SE Brazil); the mouth of the sewage outfall of the city of Santos (SOS) (touristic, densely urbanized area) and (ii) a protected area located at the city of Bertioga (touristic but less urbanized), using the Lytechinus variegatus embryo-larval development bioassay. Manipulations of TIE I were: (i) EDTA and CTAB to assess adsorptive and intrinsic intrinsic toxicity; and (ii) C18 solid-phase extraction. TIE I results for both SOS and Bertioga showed toxicity due to volatile substances at low pH, probably sulfides (but also with a possible contribution of chlorine), and organic and/or amphipathic compounds. Bertioga IW also showed significant toxicity due to NH3. TIE II aimed to specify the causes of toxicity focusing on oxidizing substances (especially chlorine), surfactants, and non-polar substances, as follows: (iv) N2S2O3 addition (aiming oxidant substances, e.g.
chlorine); (v) sublation test (to detect possible toxicity of surfactants); (vi) C18 eluates toxicity testing, following a sequential elution using firstly a water: methanol solution (1:1 v/v), and subsequently an elution with methanol only. The results of the sublation manipulation suggested surfactants as causative agents of toxicity in both SOS and Bertioiga. C18 elution indicates again that surfactants may be causing toxicity, but also more non polar compounds, e.g. pharmaceutical compounds and PAHs. Oxidant substances do not play a role in toxicity of SOS or Bertioiga sediments. Our study suggests surfactants and some other nonpolar organic substances as causative agents of toxicity in areas affected by domestic sewage in Baixada Santista coastal waters, besides the expected role of NH3 and sulfides in toxicity. Efforts in removing such substances from sanitary effluents must be prioritized.

RP128. Technique for soil sampling in wetlands

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The wetlands comprise ecosystems remain flooded for a time sufficient to occur the establishment of soggy soil and aquatic plants. They play a key role with regard to water quality, since they have the ability to filter contaminants present in water compounds and, moreover, influence the decomposition and nutrient cycling in water and soil. The watershed of the Rio dos Sinos (BHR5), located northeast of the state of Rio Grande do Sul, Brazil, is being monitored constantly. So to improve this monitoring evaluation of adjacent land is of utmost importance. The best way to assess whether the moist areas of BHRS are performing their role of water filtration is by checking the presence of metals such as lead, nickel and chromium, the soil, in view of the presence of significant industrial activity. The soil of these areas present themselves drenched in alternating periods and the collection of samples at times becomes difficult because large amounts of water can be collected by the soil sample and also his retirement in profiles can not making the default without sampling as the form of collection. Thus, this work aims at developing a technique that allows the collection of soil samples in wetlands flooded or not, to assess for the presence of metals. This to be inserted in the soil which enables excess water is removed from the sample. The material used for preparation of the mold has iron plate with paint on paint of high strength powder and can be buried 60cm deep and also allows samples to be collected in an area exact of 30cm2. The ink used for coating insulates the material, avoiding that there is contamination of the sample with components of the mold itself. Testing the mold, they were carried out in six points from two wetlands of the city of Novo Hamburgo-RS Brazil where it was possible to verify its efficiency to collect at different stages of flooding of wetlands which allowed the standardization in sampling the soil collections wetlands present along the BHR5.

RP129. Use of Rattus norvegicus as biomonitor of environmental contamination by lead pollution in the Matanza-Riachuelo river basin, Argentine.

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A bioindicator is an organism containing qualitative information about the quality of environment. In the urbanized environments, Rattus norvegicus is considered for its ecological characteristics one of the most proper species to be used as a contamination monitor for being a commensal species that lives in narrow relation with humans. The Matanza Riachuelo river basin is considered one of the most contaminated basins in the world, where environments with different land uses prevail. It is divided into three sub-basins, where the bottom one presents high contamination levels due to cloacal and industrial wastes, which are lower in the middle and top basins. This study’s objective was to analyze the use of Rattus norvegicus as bioindicators of the environmental contamination with lead using as our study-case the Matanza-Riachuelo basin. The study was realized with 76 rats captured in 8 sites located in the middle and lower basins. The samplings were realized for a year, during winter and summer. Both general and mixed linear models were used in order to model the lead concentration in liver and kidney, using as explanatory variables morphometrical characteristics of the individuals (weight and body length); gender and sediment and water concentrations of lead obtained from ACUMAR. Besides, we also incorporated to the model the seasons and place of capture, (the lowest or the middle basin). The selection criterion in the models was based on the lowest value of the AIC index. The lead concentration in water and sediments and the capture season were the only variables that had a significant effect on the kidney’s lead concentration. These concentrations were higher when the concentrations were higher both in the water (Value: 194.81; Std error: 61.72; DF: 52; t-value: 3.17, p: 0.0026) as in the sediments (Value:0.03; Std error: 0.04; DF: 3; t-value: 0.82; p: 0.4730). Also, the individuals captured in summer presented lower lead concentrations than those captured in winter (Value:-5.65; Std error: 1.32; DF: 52; t-value: -4.25, p-value: 0.0001). On the other hand, for the lead concentrations in liver, the only significant variable was the lead concentration in water (Value: 13.83; Std error: 3.99; DF: 61; t-value: 3.47, p-value: 0.0010). Although the results obtained are part of preliminary study we can conclude that R. norvegicus is a very good potential bioindicator for lead-contamination in terrestrial urban environments.
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