

is widely prescribed for human bacterial infections. The aim of this study was to evaluate the presence of both antibiotics in thirty poultry litter samples from seventeen poultry farms and thirty soil samples from six agricultural areas. Samples were collected at the main poultry center in Rio de Janeiro state, where, according to our estimates, in 2016, about 30,000 tons of poultry litter were produced and 560 kg of ENR were administered at the farms. The analyses were performed using high-performance liquid chromatography (HPLC) with a fluorescence detector. Quantification was based on linear calibration curves by matrix-matched standard solution. Samples were analyzed in duplicate. According to the results, ENR occurred in 60% of litter samples with concentrations ranging from 51 to 84,164 ng.g<sup>-1</sup>. The extreme value found was almost three fold higher than reported extreme concentration in a previous study from São Paulo poultry farms. CIP was present in 100% of poultry litter samples, with concentrations ranging from 399 to 16,247 ng.g<sup>-1</sup>. For soil samples, ENR was detected in 60%, with concentrations varying from 27 to 1,391 ng.g<sup>-1</sup>. CIP occurred in 57% of the samples with concentrations varying from 25 to 976 ng.g<sup>-1</sup>. A high persistence of both antibiotics was observed in soils, confirming previous studies, where residues (> 200 ng.g<sup>-1</sup>) were still present after eight months of application. The results confirm the need for more studies about the possible impacts derived from the constant burden of veterinary antibiotics on tropical agricultural soils, as well as the risks to food safety and human health.

#### SP035 Presence of Hormones in Antarctic Wastewater Effluents

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Many countries have established scientific stations in Antarctica. There are about 65 summer and 30 winter stations. This situation, coupled with the intensification in tourism to Antarctica in recent years, leading to an increase in anthropic pressure. Human activities generate domestic wastewaters. This type of wastes can generate impacts on the environment, especially in Antarctica, characterized by its fragility and ecosystem services that have global implications. One of these impacts can be given by the presence of hormones in wastewaters that can act as endocrine disruptors in the native biota. This work aims to measure the presence of hormones in waste water in Deception Island (DI) and King George Island (KGI), belonging both to the South Shetland Archipelago. Samples of 1 liter were taken in duplicate at the outflow of the wastewater treatment plants from the bases (one in DI and three in KGI). The samples were concentrated by solid phase extraction columns (SPE) HLB of 500 mg. The SPEs were dried and then were sent to the laboratory of Pesticides and Water in Spain. The SPEs were eluted and samples were analyzed by QTOF, determining 13 hormones. The results indicate presence of both female and male hormones in all bases sampled. The concentrations of hormones were found in the order of ng.L<sup>-1</sup>. The presence of Progesterone, cortisol, 4 Androstenedion, testosterone, Dihydrotestosterone, 11 hydroxyandrostenedione, 11 Ketoandrostenedione, 11 ketotestosterone and estrone were determined. This work marks baseline and guidelines for further improving the sustainability of the Antarctic environment. **Acknowledgments** This study was supported by the project INACH RT-09-15. The authors acknowledge logistic and scientific support of INACH during the Antarctic expeditions.

#### SP036 Psychoactive drugs in aquatic environment and ecological risk assessment

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This study focused on seven psychoactive drugs, being six benzodiazepines (alprazolam, bromazepam, clonazepam, diazepam, lorazepam and oxazepam) and one antidepressant (citalopram) widely consumed by the modern society and detected in different aqueous matrices, i.e. surface water (SW), wastewater effluent (WWE), and hospital wastewater effluent (H-WWE). Ecological risk assessment is presented for freshwater ecosystems. In total, 883 entries of measured environmental concentrations (MEC) were found, corresponding to one target compound in each aqueous matrix: 414 for WWE (121 scientific papers), 93 for H-WWE (8 scientific papers), and 376 for SW (100 scientific papers). Concentrations of all investigated psychoactive drugs in all aqueous matrices ranged from 0.14 to 840000 ng L<sup>-1</sup>. Maximum MEC for each compound in all aqueous matrices were compared to the predicted no-effect concentrations (PNEC) to estimate a risk quotient (RQ) as a MEC/PNEC ratio. PNEC values for citalopram and diazepam were calculated from acute experimental toxicity data available for aquatic organisms (algae, crustaceans and fish). In the lack of data for the other compounds (alprazolam, bromazepam, clonazepam, lorazepam and oxazepam), acute values were estimated using USEPA ECOSAR v1.11. Results indicated that citalopram presented the highest MEC values detected in SW and WWE

(76000 and 840000 ng L<sup>-1</sup>, respectively). Bromazepam exhibited the lowest MEC (19 ng L<sup>-1</sup>) detected in SW. Green algae were found to be the most sensitive group to almost all psychoactive drugs, except for diazepam (*Daphnia magna*), which exhibited the lowest calculated and derived effect concentrations and were, therefore, used to derive PNEC values. Due to the high MEC values in SW, an extreme level of risk was assigned to citalopram (47.5) and alprazolam (5.5); the others psychoactive drugs showed RQ < 1. Risk based on WWE concentrations was considered extreme for citalopram (525.0), followed by bromazepam (4.7), and oxazepam (2.3). MEC values for H-WWE indicates that only Oxazepam (4.4) may pose a threat to receiving water bodies. Uncertainties regarding compounds solubility in water could alter the predicted effects by ECOSAR and therefore further evaluation through ecotoxicological assays is strongly recommended. Results found in the study corroborate with the consolidated observation that wastewaters effluents are the major source of pharmaceuticals detected in surface waters.

#### SP037 Resultados preliminares da avaliação do risco ambiental dos fármacos loratadina e cetirizina para *Chironomus xanthus*

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A loratadina e cetirizina são anti-histamínicos muito utilizados pela população para o tratamento de doenças respiratórias como asma, resfriados e congestão nasal. A incompleta eliminação dos resíduos farmacêuticos e seus metabólitos nas estações de tratamento de esgotos (ETE's) podem ser considerados um dos principais contribuintes do lançamento desses poluentes nos corpos hídricos. Dessa forma, os organismos aquáticos estão continuamente expostos a tais compostos. Dados encontrados na literatura demonstram a ocorrência da cetirizina e da loratadina em estações de tratamento de efluentes, bem como em corpos hídricos receptores em concentrações da ordem de ng/L a µg/L (Gros *et al.*, 2006; Bahlmann *et al.*, 2012). Nesse contexto, o objetivo do presente estudo foi determinar o valor da CL<sub>50</sub> da cetirizina e loratadina para o organismo teste *Chironomus xanthus*. Para tanto, foram realizados ensaios de toxicidade aguda com 96 horas de duração, seguindo a metodologia descrita por Fonseca & Rocha (2004). Para o cálculo da CL<sub>50</sub>, 96h utilizou-se o programa Trimmed Spearman-Kärber (Hamilton *et al.*, 1977). Os resultados preliminares determinaram os valores médios da CL<sub>50</sub>96h para *C. xanthus* expostos a cetirizina e loratadina de 198,07 e 2,40 mg/L, respectivamente. Muito embora os valores encontrados no presente estudo estejam acima das concentrações comumente detectadas no ambiente, estes valores podem representar um potencial risco ecológico nos ecossistemas aquáticos, uma vez que a entrada desses compostos no ambiente é intermitente e a exposição contínua a doses subletais, bem como os efeitos combinados desses fármacos podem provocar alterações fisiológicas e comportamentais não previstas nos testes de toxicidade aguda. Dessa forma, este trabalho revela a necessidade de se ampliar os estudos com tais fármacos, avaliando-se os efeitos da exposição prolongada, bem como os da mistura, a fim de se obter uma melhor compreensão dos riscos ambientais da sua presença nos ecossistemas aquáticos.

#### SP038 Sensitivity of *Nitokra* sp copepod exposed to UVA and UVB filters used in commercial formulations

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Large discharges of pollutants released in the marine environment have as final destination the sediment, affecting the quality and biodiversity. Pharmaceuticals and personal care products (PPCPs) are lipophilic and poorly biodegradable, with potential for bioaccumulation and persistence in the environment. Compounds from commercial sunscreens are found in the oceans, because they are often used by people. This study evaluated the acute effect of UVA and UVB filters - Benzophenone-3 (BZ-3), Octyl Salicylate (OS) and Octyl Methoxycinnamate (OMC), detected in commercial sunscreens, performing the test both in a mixture as isolated - using *Nitokra* sp copepod and the method described in ISO14669:1999. When exposed to the water soluble fraction of the UV filters mixture, the mean of LC50-96h was 11.47 %, corresponding to 190 mg.L<sup>-1</sup> of BZ-3, 150 mg.L<sup>-1</sup> of OS and 230 mg.L<sup>-1</sup> of OMC, while the isolated UV filter showed a tendency to increased lethality. The tests were performed in parallel with the reference substance DSS, and were within the acceptability limits of the LECOTOX LC50-96h = 7.76 (3.98-11.55) mg.L<sup>-1</sup> DSS. It was concluded that the test organism and the method used were suitable for the tests

with the commercial UV filters mixture and that, although the filters used are fat-soluble, there are bioavailable concentrations in the environment. The tested mixture caused deleterious effects to *Nitokra* sp. in concentrations lower than ANVISA (2006) allows, therefore more research is needed.

#### SP039 Toxicity of 17 $\alpha$ -ethynylestradiol in estuarine sediments for the fecundity of the copepod *Nitokra* sp.

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The increasing use of pharmaceutical compounds, both human and veterinary, has raised concern about their discards. In coastal zones, the discharge of sanitary effluents is done by sewage outfalls and also directly by homes not served by basic sanitation, which causes risk to marine biota. Therefore, assessments of the effect of potentially toxic compounds from sanitary effluents on marine organisms are required. One of the compounds found is 17 $\alpha$ -ethynylestradiol (EE2), a synthetic hormone found in contraceptive drugs. Due to its relatively high K<sub>ow</sub>, EE2 may adsorb to the sediments in marine or estuarine environments. The current study aims to evaluate the effect of 17 $\alpha$ -ethynylestradiol in estuarine sediments to a benthic copepod. Harpacticoid copepods are ecologically relevant to estuarine ecosystems because it is the basis of the trophic chain. Gravid *Nitokra* sp. females were exposed to clean natural sediments spiked with different concentrations of 17 $\alpha$ -ethynylestradiol (0.1 to 100  $\mu$ g/kg plus sediment and co-solvent negative control treatments and after 7 days the production of nauplii and copepodites was recorded. The assays were performed under static conditions, 25 $\pm$ 2 °C, and 12:12h light:dark cycle. 4 replicates were done for each treatment. A fertility index was estimated based on the number of descendants produced by each adult female. The data were evaluated for their normality (Shapiro-Wilk test), and homoscedasticity (Levene test) The treatments (different concentrations) were compared to the respective controls (water, sediment or sediment only and co-solvent) through one-way ANOVA (with Dunnett post test). For all tests,  $\alpha$ =5%. The results show an inhibition of the reproduction on the highest concentrations of EE2 in the sediments. In the 100  $\mu$ g/kg of EE2, the fertility of *Nitokra* sp. was significantly reduced in relation to the sediment and co-solvent control treatments. Previous studies have reported that this concentration is environmentally relevant, which reveals a high environmental risk of this pollutant of emerging concern to the *Nitokra* sp.

#### SP040 Ecotoxicological study and environmental risk assessment of the antihypertensive Losartan in a Brazilian coastal zone

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The antihypertensive losartan (LOS) is among the most commonly consumed drugs in many countries. Although LOS has been detected in the marine environments, there is a lack of ecotoxicological studies assessing metabolism and effects on invertebrates. In the present study an environmental risk assessment was performed employing the measured environmental concentrations (MEC) in surface water from Santos Bay (Brazil), and a battery of biomarkers to evaluate sublethal responses. It was found occurrence of LOS at the maximum concentration of 32 ng.L<sup>-1</sup>. Biomarkers results demonstrated induction of CYP like, GST and GPx activities, as such as DNA and lysosomal membrane damages. Considering the integration between MEC and PNEC, a risk quotient higher than "1" (RQ> 1) was established, which indicates significant environmental risk of LOS in this coastal zone.

### The Future of Pesticides in Sugarcane - Environmental and Management Perspectives

#### SP041 Cow bone char as an adsorbent to decrease hexazinone leaching in a Brazilian soil

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Hexazinone (3-cyclohexyl-6-dimethylamino-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione) herbicide is used extensively in sugarcane throughout the Brazil, and can be easily leached to groundwater sources. Bone char (BC), as well as biochar have been shown to strongly sorb organic compounds and could be used as an adsorbent to increase herbicide sorption and decrease leaching, although its application form is still little known. The aim of this research was to assess the adsorbent effect of a cow BC on the leaching of hexazinone applied to the topsoil and incorporated surface layer (0-10 cm) in a sandy loam Brazilian soil under laboratory conditions. The BC was added to soil at 0 (control – unamended) and 5% (w w<sup>-1</sup>) ratio, corresponding 60 t ha<sup>-1</sup>. A glass column (0-30 cm) was prepared for each treatment and analyses of <sup>14</sup>C-herbicide were performed by liquid scintillation counter. The leached was collected after 200 mm rainfall simulation over 48 h. Hexazinone residues were detected throughout the soil profile, reaching the deepest layers (25-30 cm) around 28%, and the highest amount of this herbicide was found in the leached (~41%) in the unamended soil. However, when the soil was amended with BC in the topsoil the herbicide was fully retained in the BC and when this material was incorporated in the topsoil, the hexazinone remained retained 0-5 cm deep not reaching the other depths and leached. We conclude that the cow bone char is an excellent adsorbent to reduce leaching of hexazinone in a Brazilian soil through the high sorption of this herbicide on BC, regardless of application form of the carbonaceous material. **Acknowledgements:** The authors would like to thank the São Paulo Research Foundation (FAPESP) process 2016/17683-1, for the financial support.

#### SP042 Hexazinone and diuron runoff in green cane systems

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Sugarcane is a major crop in Brazil and of great importance to the world. Higher yields implicate in higher use of pesticides, such as diuron and hexazinone. The adoption of green cane system, in which the straw is kept in the soil surface after mechanical harvesting, has changed the environmental behavior of these herbicides. Therefore, the goal of this research was to evaluate runoff losses of diuron and hexazinone in green cane systems. The 3x2x2 (12 treatments) factorial experiment was performed in a randomized block with 4 replicates. The factors were i) 3 levels of sugarcane straw (0, 50% and 100%, based on a dose of 14 t ha<sup>-1</sup>); ii) 2 levels of initial soil moisture (10 and 18% VWC), and iii) 2 rainfall periods (0 and 3 d after herbicides application). A rainfall simulator was adjusted to simulate an 80 mm h<sup>-1</sup> rainfall event for one and a half hour (120 mm) over plots of 1 m<sup>2</sup>. A commercial product containing diuron and hexazinone was used at rate of 3 kg ha<sup>-1</sup> dissolved in 700 L ha<sup>-1</sup>, according to label recommendations. The amounts of water and sediments were registered and herbicides concentrations analyzed by UPLC. Herbicides attached to the sediments were estimated according to sorption data from the literature. The results were evaluated by ANOVA and means compared by Tukey test (p< 0.05). Sugarcane straw decreased water, sediments, and diuron losses by runoff, but did not affect hexazinone losses. In other words, crop residues cannot prevent losses of highly soluble molecules, such as hexazinone. Greater herbicides losses were observed in the aqueous phase, even for the control treatment (without straw), since straw reduces the amounts of detached sediments. However, no difference was observed between the two levels of straw (50 and 100%), meaning that 7 t ha<sup>-1</sup> is sufficient for mitigating water, sediments, and diuron losses by runoff. Higher soil moisture (18 versus 10%) resulted in higher herbicides runoff. Yet, rainfall period did not affect herbicide losses, indicating that 3 days were not long enough for enhancing these herbicides dissipation or sorption.

#### SP043 Highly effective removal of azoxystrobin from drinking water using a bone char

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Azoxystrobin (methyl (E)-2-2-[6-(2-cyanophenoxy)pyrimidin-4-yloxy]phenyl-3-methoxyacrylate) is a post-emergence broad spectrum strobilurin fungicide of the class of synthetic compounds called  $\beta$ -methoxyacrylates and used mainly for cereals. Bonechar has been used extensively as an adsorbent. However, bonechar as an adsorbent to remove fungicide in water has been not reported. The aim of this research was evaluating cow bone char added as an adsorbent for removing azoxystrobin from drinking water samples. Drinking water samples (10 mL) were collected from a cold water faucet, which are used regularly for human consumption. Concentration at 5  $\mu$ g mL<sup>-1</sup> of azoxystrobin was prepared and added directly in drinking water contaminating with fungicide. This drinking water was amended at 0 (control – unamended), 0.01, 0.1, and 1 g of cow bonechar, and supernatants were analyzed at 1 and 7 d by high-