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Editorial

Guest editorial

This Special Issue of Environment International presents selected papers given at the Sixth Iberian and 3rd Latinoamerican Congress on Contamination and Environmental Toxicology held in Cadiz (Spain) from 25th to 28th September 2005. The theme of the Special Issue (SI) is "Environmental contaminants and their effects: links between environmental chemistry and toxicology". The selected papers in this SI attempt to fill the gap between studies of contamination and studies of toxicology, with an emphasis on combining both approaches in the same work. Twenty five papers have been collected together, including the plenary lectures: 'Trace metal bioaccumulation: models, metabolic availability and toxicity' by Philip S. Rainbow; 'Nuclear receptors and susceptibility to chemical exposure to aquatic organisms' by Afonso C. D. Bainy; and 'Determining when contamination is pollution — weight of evidence determinations for sediments and effluents' by Peter M. Chapman.

Although the papers have not been subclassified into different topics, it is possible to distinguish different approaches to the theme of the Special Issue.

Thus several papers focused on sediments, addressing how chemical analysis and bioassays can be used to investigate their potential ecotoxicological status. Cesar et al. compared coastal ecosystems from Spain (Gulf of Cadiz) and Brazil (Santos and São Vicente estuary) using principal component analysis, sediment toxicity tests and physicochemical data. They found that environmental degradation was related to availabilities of PAHs and trace metals in both ecosystems, while toxicity attributable to PCBs only applied to the Santos and São Vicente estuary. Viguri et al., using a multidisciplinary approach, investigated the physicochemical and toxicological characterizations of historic estuarine sediments from Santander Bay (northern Spain) using sediment cores. Their results showed an increase in contamination from industrial and urban activities, and allowed the establishment of geochemical baselines for trace metals and PAHs, so providing a preliminary environmental quality assessment of the Santander Bay sediment. The work of Nieto et al. studied the Tinto and Odiel Rivers in southern Spain, both affected by acid mine drainage, estimating seasonal variation in the dissolved loads of contaminants transported by the rivers, and conducting toxicity and bioaccumulation tests to evaluate their bioavailabilities. The mobility and bioavailability of Zn, Cd and Cu were affected by marine influence. Casado et al. considered the ecotoxicological effects of dredging — an important topic from both scientific and socioeconomic points of view, establishing the importance of the exposure route and the test selected for any decision making process. Martín-Díaz et al. evaluated the ecotoxicological effects associated with contaminants in dredged material using a marine biotest based on metallothionein-like proteins in a crab. They found that a toxicokinetic approach was a sensitive tool for evaluating the bioavailability of the contaminants. In their study of sediment characterisation and sediment toxicity tests, Guerra et al. showed that the Microtox test was not biased by sediment characteristics. Jimenez et al. analysed the link between chemical data and chronic toxicity data for environmental quality assessment and regulatory purposes, using a multivariate analysis approach to link biological responses, chemical concentrations in sediment and chemical residues in biological tissues. Moreno-Garrido et al. presented a new sediment toxicity test using immobilised microalgae, demonstrating the usefulness of this system for "in situ" experiments. Hampel et al. carried out an environmental risk assessment at a site specific environment for linear alkylbenzene sulphonate (an anionic surfactant) using two approaches — assessment factors and an equilibrium partitioning method; the results showed that Predicted Non-Effect Concentrations (PNEC) obtained with acute toxicity data were over-conservative. The question of when contamination becomes pollution was discussed by Chapman in his plenary lecture; establishing when contamination is, or may in future become, pollution requires a weight of evidence approach combining different lines of evidence.

Three papers concentrated on soils. Pérez-Sirvent et al. used an ecotoxicological approach to show that the addition of marble cuttings caused a subsequent decrease in metal mobility and toxicity. Alvarenga et al. examined the use of different biodegradable organic residues for application to agricultural land, recommending a battery of toxicity tests in conjunction with chemical analysis to address the potential environmental risk deriving from such disposal procedures. Mingorance et al. studied total metal concentrations in soil and samples from two Mediterranean plant species growing in an industrial area; although the concentrations of some metals were in line with natural variation, others such as copper and lead were anthropogenically enhanced.

The use of biomarkers represented another approach to linking environmental chemistry and toxicology, in both laboratory and field studies. Tejeda-Vera et al. determined lipid peroxidation, enzyme activities and other physiological parameters

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in two fish species. They found that the ecosystem under study was affected by wastewater from the local sugar industry, with physiological changes in the fish being provoked, albeit with different intensities. Ureña et al. found differences in metal and metallothionein tissue concentrations, and in the relationship between them, between wild and farmed fish. Vega-López et al. used different biomarkers to assess PCB toxicity in an endangered goodeid fish, finding sex differences related to PCB biotransformation. A correlation was found between alcohol dehydrogenase activity and PCB level, and possible action mechanisms have been described. Lüchman et al. measured the activities of total and Pi-class glutathione-*S*-transferases in the hepatopancreas of pink shrimp; the results showed the importance of seasonal metabolic variation in the enzyme activities of this penaeid that need to be taken into account in environmental monitoring programmes. In order to develop an integrated risk assessment strategy, Bebianno et al. collected mussels from different sites and employed an active biomonitoring approach and subsequent analysis of organic chemical residues and cytochrome *P*-450 and GST activities. Cytochrome *P*-450 gave a reliable response and was supported as an appropriate biomarker in risk assessments for organic contaminants. Ventura-Lima et al. analysed the effect of As(III) on the antioxidant responses of a polychaete worm in laboratory conditions. They concluded that As interfered with the antioxidant defence system of the worm at low concentration, and that this species showed a high methylation capacity, although lacking an ability to remove or biotransform all the administered As(III). The presence, biotransformation and effects of sulphophenylcarboxylic acids (SPC) in a benthic fish were analysed by Álvarez-Muñoz et al.; these compounds are degradation products of the anionic surfactant linear alkylbenzene sulphonate (LAS) and are found at high concentrations close to waste water treatment plant outlets. In an exposure experiment carried out using a flow-through system at realistic concentrations, SPCs in fish tissues increased with exposure and decreased when the exposure was ended and the fish transferred to clean water. Significant variation in antioxidant enzyme activities was observed at higher SPC exposures. A review of nuclear receptors (NR) and their susceptibility to chemicals in aquatic organisms was provided by Bainy. Xenobiotics can bind to NR, thereby disturbing signalling pathways. NRs are also implicated in the adverse effect of endocrine disrupting compounds, and possible mechanisms are addressed in this paper. An integrated approach exploring the link between trace metal bioaccumulation and toxicity was described by Rainbow; the biodynamic model proposed by this author allows the prediction and explanation of widely different accumulated trace metal concentrations in aquatic invertebrates. The combination of this biodynamic model with an understanding of the relationship between bioaccumulation and toxicity allows us to interpret the ecotoxicological significance of trace metal concentrations in aquatic invertebrates.

Rey-Asensio and Carballeira presented a protocol for biomonitoring the atmospheric levels of fluoride using cultures of the grass *Lolium perenne.* This species integrates the bioavailable fraction of fluoride in the local environment, providing an assessment of its actual impact on the vegetation. Da Cruz et al. examined the usefulness of early-life stages (ELS) (larvae) of the oyster *Crassostrea rizhophorae* to provide surrogate measures of the effects of pollutants on ecosystems; they proposed that EC15 is the critical value for the *C. rizophorae* embryonic development test, and that zinc sulphate and 4-chlorophenol are the best reference toxicants for the test. Problems caused by emergent contaminants were considered by Santos et al., specifically the occurrence of four anti-inflammatory drugs (diclofenac, ibuprofen, ketoprofen and naproxen), an antiepileptic drug (carbamazepine) and a nervous stimulant (caffeine) in the influent and effluent of waste water treatment plants. A WWTP removes between 6 and 98% of the pharmaceuticals, although risk quotients calculated as the ratios between measured environmental concentrations and PNEC were higher than 1 for naproxen and ibuprofen in the influent and for the last compound in the effluent also.

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