ENDOCRINE DISRUPTION

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Early studies performed in the 90’s by the CBET group both in the laboratory and in the field in different Basque estuaries demonstrated the potential of environmental pollutants to affect the reproductive potential of aquatic organisms. Effects on reproduction could be based on a variety of mechanisms. Notably, several chemicals present in the aquatic environment cause adverse effects on growth, behavior, reproduction and immune function of aquatic wildlife by interfering with the endocrine system. Those chemicals that alter function(s) of the endocrine system and consequently cause adverse health effects in an intact organism, or its progeny, or (sub)populations have been named "endocrine disruptors ". In the EU-funded BEEP project (2001-2004) we studied effects of several endocrine disruptors such as alkylphenols, pesticides, plasticizers, oil derivatives, synthetic hormones and polybrominated compounds on zebrafish and mussels. At the same time, we studied the gametogenic cycle of wild populations of mussels from Galicia and Bay of Biscay area since 2003 (MEC project PRESTEPSE and ETORTEK project IMPRES, 2003-2007) and found some alterations in gamete development. In March 2004 an abnormally high number of hermaphrodite mussels was found in the Urdaibai Biosphere’s Reserve. Thus, the project DERBIUR was funded by the UNESCO Catedra of UPV/EHU (2007-2008) with the objective of determining the presence of potential endocrine disruptors in Urdaibai and their possible effects on bivalve molluscs and fish. The results of the project confirmed alterations in mussels and showed a high prevalence of intersex fish (thicklip grey mullet) sampled close to the sewage treatment plant of Gernika. Chemical analyses performed by the CSIC of Barcelona confirmed the presence of high concentrations of nonylphenol (a potent endocrine disruptor included in the list of prioritary testing substances by EU) in the bile of fish. In view of the potential relevance of alkylphenols in Urdaibai, a second project called SICAES was funded by the UNESCO Catedra (2008-2009) in collaboration with the groups of Analytical Chemistry and Organic Chemistry II of UPV/EHU. The objective of SICAES is to characterize xenoestrogenic effects of new nonylphenol isomers using in vitro gene reporter assays with the estrogen receptor (YES assay) and laboratory in vivo experiments with zebrafish.

In all these studies we apply a battery of biomarkers including changes in the levels of vitellogenin (female specific protein used as marker of xenoestrogenic or feminizing effects), aromatase gene expression levels (enzyme responsible for synthesis of estrogenic hormones), and gonad histology, in addition to studies on hormone receptors and in vitro gene reporter assays. These tools could be applied in biomonitoring programs and in chemical spills such as we tested for example in the EU project PRAGMA (2006-2007). Recently, we have started a collaboration with scientists from the University of Cantabria, CSIC of Barcelona and an engineering company to study the endocrine disruption potential of urban and paper mill effluents to transplanted mussels.
List of 5 most relevant publications on endocrine disruption:


ORTIZ-ZARRAGOITIA, M; CAJARAVILLE, MP. Effects of selected xenoestrogens on liver peroxisomes, vitellogenin levels and spermatogenic cell proliferation in male zebrafish. *Comparative Biochemistry and Physiology Ser C*, 141: 133-144 (2005).
