ENDOCRINE DISRUPTION

Laboratory studies with zebrafish

Endocrine disruptors can alter sex determination and differentiation in exposed organisms. We observed the exposure of eggs to endocrine disrupting compounds such as ethynylestradiol (synthetic hormone used in contraceptive pill and diethylstilbestrol (stilbestrol) cause developmental abnormalities in zebrafish larvae juveniles together with elevated gene expression levels of vitellogenin and aromatase CYP19A2. We have observed that exposure of adult mussels to EDs such as crude oil and produced water mixtures found in oilfields or extraction platforms, provoked changes in vitellogenin-like protein levels. Alteration of gamete development has been also observed in female mussels showing high presence of atretic gametes (left-down picture) in comparison to control females (left-up picture). These alterations of gametes quality were related with low fecundity and poor larvae development (see pictures in the right side), leading to a reduction in larval survival.

Laboratory studies with mussels

Mussels are also sensitive species to endocrine disruptors. The team routinely study vitellogenin-like protein levels in mussel gonads and gonadal development in mantle histological sections. We also applied mussel larvae based bioassays in collaboration with IFREMER research center (Nantes). We have shown that exposure of adult mussels to EDs such as crude oil and produced water mixtures found in oilfields or extraction platforms, provoked changes in vitellogenin-like protein levels. Alteration of gamete development has been also observed in female mussels showing high presence of atretic gametes (left-down picture) in comparison to control females (left-up picture). These alterations of gametes quality were related with low fecundity and poor larvae development (see pictures in the right side), leading to a reduction in larval survival.

Field studies in Urdaibai

In 2004 an abnormally high number of hermaphroditic mussels was found in the Urdaibai Biosphere’s Reserve. Thus, the project DEBRUR was funded by the UNESCO Caledo (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 a high prevalence of interest fish (thioldy-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 priority testing substances by EU) in the bile of fish. In view of the potential relevance of alkyphenols in Urdaibai, a second project called SICAES was funded by the UNESCO Caledo (2008-2009) in collaboration with the group of Analytical Chemistry and Organic Chemistry of UPV/EHU. The objective of SICAES is to characterize xenobiotic effects of new nonylphenol isomers.

Sources of endocrine disruptors

Sources of endocrine disruptors

- Pharmaceuticals
- Plastics (phthalates)
- Agricultural runoff
- Pesticides
- Urban runoff
- Oil spills
- Shipyards (TBT)
- Municipal waste
- Industrial discharges
- Spill

Our tools to study endocrine disruption

We apply a battery of biomarkers including changes in the levels of vitellogenin (female specific protein used as marker of xenoestrogenic or feminizing effects, shown in the left side), aromatase gene expression levels (enzyme responsible for synthesis of estrogenic hormones, shown in the right side), and gonad histology, in addition to studies on hormone receptors and in vivo genome reporter assays.

List of 5 most relevant publications:


ORTIZ-ZARRAGOTIJA, M; CARJARAVILLE, MP; Effects of selected sediments on liver peroxisomes, vitellogenin levels and spermatozoal cell maturation in male zebrafish. Comparative Biochemistry and Physiology part C 141: 133-144 (2005).

ORTIZ-ZARRAGOTIJA, M; CARJARAVILLE, MP; Biomarkers of exposure and reproduction-related effects in mussels exposed to endocrine disruptors. Archives of Environmental Contamination and Toxicology 50: 361-369 (2005).

PORTE, C; JANER, G; LORUSSO, LG; CARJARAVILLE, MP; D; ORTIZ-ZARRAGOTIJA, M; FOSSATI, M; & CANESI, L. Endocrine disruptors in marine organisms: approaches and perspectives. Comparative Biochemistry and Physiology, part C 143: 303-315 (2006).