Early lysosomal membrane destabilisation on exposure to pollutants in mussel digestive cells

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Abstract

Lysosomal biomarkers are used as early warning signals of biological effects caused by environmental pollutants. The aim of this work was to determine the response time of digestive cell lysosomes in mussels exposed to metals and hydrocarbons. Mussels, *Mytilus galloprovincialis*, were exposed, under laboratory conditions (80 mussels in 10 l tanks at 16 °C), to 0.5 μg Cd/l seawater and to the water-accommodated fraction (WAF) of a lubricant oil (5% v/v). A control group was also carried out. Water and pollutants were daily changed at 10 a.m. Mussels were fed (commercial invertebrate food) twice per day (10:00 and 18:00). One mussel per experimental group was sacrificed every hour from 0 h to 30 h and processed. Lysosomal Membrane Stability test was applied after acid phosphatase histochemistry on cryostat sections. After 4 h exposure the lysosomal membrane was already destabilized (Labilisation Period: LP < 6 min) in Cd and WAF exposed mussels in comparison with controls. Further no more marked effect neither recovery were observed. LP values in the controls series only decreases transiently just after feeding. In order to determine statistically significant changes in LP values, 5 mussel pools were used as representative of each 5 h period. Mann-Whitney U test revealed that after 5 h exposure LP values in Cd and WAF exposed mussels were significantly reduced and further they did not reduce beyond the values recorded during the first 5 h. Funded by Consolidated Research Groups (University of the Basque Country). U. I. was recipient of a pre-doctoral fellowship (Basque Government).

Metallothionein levels in the liver and blood of *Sparus aurata* as biomarker to cadmium intoxication

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Abstract

Cadmium is a widespread environmental contaminant with a high toxicity and its presence in coastal marine environments is well known. One of the responses of the fish to cadmium

contamination is the induction of metallothionein levels. The purpose of this work is to use a toxicokinetic approach to address the mechanism of metallothionein induction associated with Cd in juveniles in the fish *Sparus aurata*. Individuals of the fish were injected i.p. with 2.5 mg Cd in saline solution (0.9% NaCl) by kg body weight at the beginning of the experiment. Metallothionein levels were determined according to the procedure described by Olafson and Olsson (1991) with minor modifications. Cadmium concentration in blood and liver were analysed by anodic stripping voltametry. The induction of this protein along the assay (t = 3 and 6 days) was determined. The relationship between blood and liver MT levels and the concentration in the target tissue was also analysed. Results showed that cadmium provoked the induction of MT levels in treated organisms with respect to control fish along the experiment.

Biomarker responses in juveniles of the fish *Sparus aurata* exposed to contaminated sediments

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Abstract

Nowadays the quality of coastal sediments is under an important antropogenic pressure derived from the activities developed in these areas. For this study different coastal areas affected in different ways by human activities were selected and the adverse effects associated with the contaminants bound to sediments were tested using a chronic bioassay with juveniles of the fish *Sparus aurata* (seabream). The applied approach evaluates sediment quality by using an integrated assessment including chemical and ecotoxicological data along the time. Fishes were exposed to these contaminated sediments and samples from different tissues were collected during the 60 days of the experiment. Biomarkers of exposure (metallothioneins and EROD) and biomarkers of effect (histopathology) associated with the enrichment of contaminants in sediments were analyzed during the exposure period. A multivariate analysis approach was used to correlate concentration of contaminants and sublethal effects measured in individuals of fish exposed to those sediments. Results show the correlation of biomarkers of exposure to those concentrations in sediments, metals related to MTs and PAHs to EROD. Besides, a toxicokinetic approach is proposed to address the mechanism of adverse effect related to the biomarkers responses.

Characterization of dredged material using juveniles of the fish *Sparus aurata* in the Spanish coast