

CYTOCHROME P450 RESPONSES AND ACETYLCHOLINESTERASE ACTIVITY IN THE GOLDEN GREY MULLET *LIZA AURATA* FOR EVALUATING URBAN EFFLUENTS EFFECTS IN A COASTAL MARINE AREA : GULF OF TUNIS.

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Abstract

Biomarkers measurements were investigated in juveniles of the golden grey mullet *Liza aurata* sampled in autumn /Spring (2002/2003) from two sites of Tunis gulf in order to assess the impact of two urban effluents "Khelij channel" and "Meliane wadi". Results showed a strong induction of EROD in fishes captured from both Khelij and Meliane outlets and they indicate probably a contamination by aromatic and chlorinated hydrocarbons. Also a significant inhibition of acetylcholinesterase activity was demonstrated in fishes from the two sites in autumn. We suspected then the presence of neurotoxic compounds as organophosphates and carbamates.

Keywords: Pollution, Biomarkers, Fish.

Introduction

The Biomarker constitute the biological reaction measurement implied in the early intoxication steps. Among biochemical biomarkers, the cytochromes P450 family is implied in oxidative metabolism of xenobiotics such as aromatic and chlorinated hydrocarbons. The measurement of EROD activity (ethoxyresorufin-o-deethylase activity, a cytochrome P450 dependant monooxygenase) in fish liver is widely validated in monitoring programs. The acetylcholinesterase (AChE), enzyme implied in the neurotransmission, is also considered as a useful biomarker since it's inhibited by organophosphorus and carbamate compounds. The aim of the present study was to assess the quality of a coastal marine area in Tunis gulf by measuring AChE and EROD activity in an euryhaline fish, the golden grey mullet (*Liza aurata*), captured from mouths of two channels, "Khelij" and "Meliane", flowing into the sea

Methodology

Juveniles of golden grey mullet (6-8 cm long) were caught around the outlets of "Khelij" and "Meliane" channels during autumn/spring (2002/2003). Liver and fragments of muscle are removed and kept in liquid nitrogen for biomarkers analyses. EROD measurement was performed in fish liver according to the French normalized method [1]. AChE activity was determined in the muscle of fish according to Ellman method [2]. Statistical analyses were performed with Statistica software (StatSoft, USA). Data were log-transformed for achieving normal distribution before running ANOVAs to determine statistical differences among sampling sites and season.

Results

Results on EROD activity showed that this biomarker was significantly elevated ($p < 0.05$) in fishes caught in both Khelij and Meliane outlets (Table 1) when compared to control fishes reared in our laboratory (43.3 ± 23 pmol/min/mg protein). These biomarkers levels are probably linked to the presence of high levels of compounds known to induce metabolic activity in fish livers as aromatic and chlorinated hydrocarbons. We have already reported the presence of an organochlorine pesticide, the lindane, in the sediment of Khelij outlet [3]. EROD levels in the present study are higher than those reported in the leaping mullet (*Liza saliens*) from a highly contaminated bay of the Aegean sea (Izmir bay) exposed to river/water contamination [4]. EROD values in control fishes are similar to those registered in the grey mullet from a reference site in the Orbetello lagoon, Italy [5]. A significant difference in EROD activity between sites are registered in spring. In fact, in this season, the biomarker levels are higher in Meliane outlet than in Khelij site. These results suggest that exposure to some xenobiotics varies according to the different locations. And they reflect the influence of differential contamination levels on a short time scale.

Concerning AChE activity, we registered also a significant inhibition of this enzyme ($p < 0.05$) in the muscle of fishes from the two sites in autumn and from Khelij outlet in spring in comparison to the activity measured in reference fishes reared in the laboratory (Table 1). Similar levels of reduction was already registered in red mullet from Italian coastal marine area [6]. These data point out the exposure of mullet fishes to anticholinesterase compounds. In fact, the leaching of pesticides into the sea from agricultural land and the discharge of urban wastewaters in these areas are responsible to this contamination.

Table 1. Results of biomarkers measurements in golden grey mullet. EROD activity is expressed as pmol/min/mg protein. AChE activity is expressed as nmol/min/mg protein. Data are expressed as mean \pm standard deviation

		Khelij	Meliane	Control
EROD	Autmn	654.8 \pm 602	1007.5 \pm 767.3	43.3 \pm 23
	spring	466.6 \pm 322	1356.5 \pm 390	
Ln-transformed EROD	Autmn	6 \pm 1	6.5 \pm 1	3.65 \pm 0.5
	spring	5.8 \pm 1	7.3 \pm 0.3	
AChE	Autmn	1079 \pm 500	910 \pm 546	2360 \pm 708
	spring	1360 \pm 345	2117 \pm 1117	
Ln-transformed AChE	Autmn	6.8 \pm 0.4	6.6 \pm 0.5	7.7 \pm 0.3
	spring	7.1 \pm 0.2	7.5 \pm 0.5	

In conclusion, this work highlighted the first data about health status of the gold mullet from Tunis gulf. These preliminary results showed that the use of biomarkers in this fish species might reflect the early exposure to micropollutants. As we dispose a few information about contaminant levels in this coastal area, a more detailed investigation must be done.

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