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Biological effects of PAHs and heavy metals in *Mytilus galloprovincialis*: Assessment of the petrochemical industry in the Sicilian Coast, Italy

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INTRODUCTION

The use of biomarkers to analyze the effects of exposure to chemical contaminants in the aquatic environment is more extended nowadays[1,2]. Mussels are sedentary filter-feeding organisms which may be exposed to large amounts of chemical pollutants. Mussels are prone to bioaccumulation and magnification of contaminants[3,4].

Objective: The aim was to evaluate the biological effects of the environmental pollution related to PAHs and heavy metals from the petrochemical industry in *Mytilus galloprovincialis*.

METHODS

Mussels, previously transplanted (active biomonitoring), were collected from 3 areas (Figure 1) of the Eastern coastline of Sicily (Italy): a) a petrochemical industrial harbor area between Augusta and Priolo, severely contaminated by PAHs and heavy metals; b) Brucoli, a littoral zone without xenobiotics; and c) a pristine reference site, from which proceed the population of *M. galloprovincialis*. Animals were sacrificed and digestive gland was used for analysis of antioxidant enzyme activities (catalase and glutathione-S-transferase), oxidative damage (malondialdehyde), ARN expression (antioxidant enzymes, metallothioneins (MT10 and MT20) and cytochrome isoenzyme P450 (CYP3A1)) and neurotoxicity (Acetylcholinesterase (AChE)).

RESULTS

A significant increase in the CAT and GST activities, and MDA levels of mussels from Priolo was observed. GST and MTs gene expressions were significantly induced in mussels from Priolo when compared to the reference site. AChE activity decreased in Priolo. No significant differences between the three sampling sites in the expression of the CYP3A1 was observed.

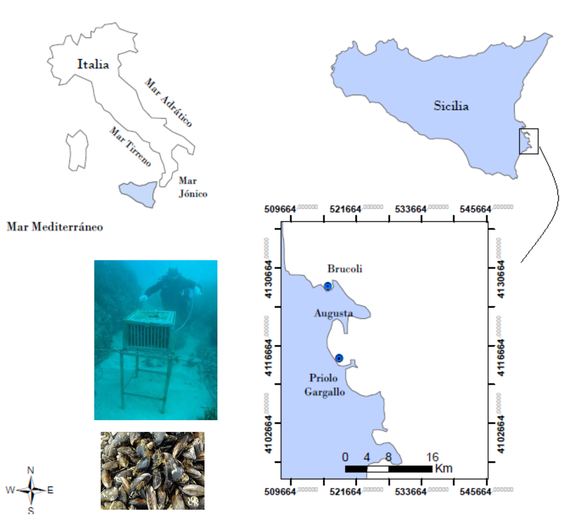

Figure 1: Areas were mussels were sampled (Messina region, Italy).

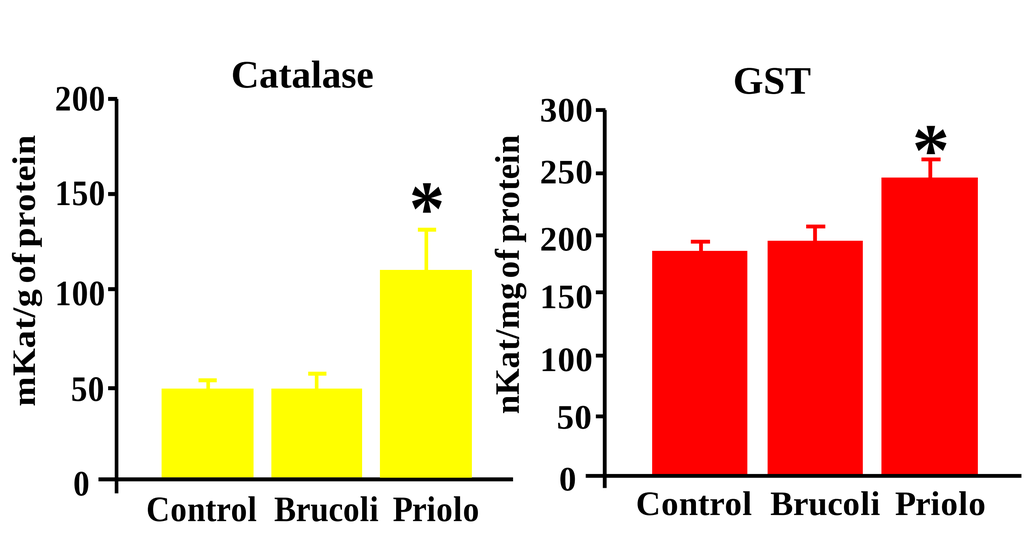

Figure 2: CAT and GST activities in digestive gland of mussels. Bars represent mean ± SEM (n=10). * p<0.05 when compared with control and Brucoli (one-way ANOVA analysis).

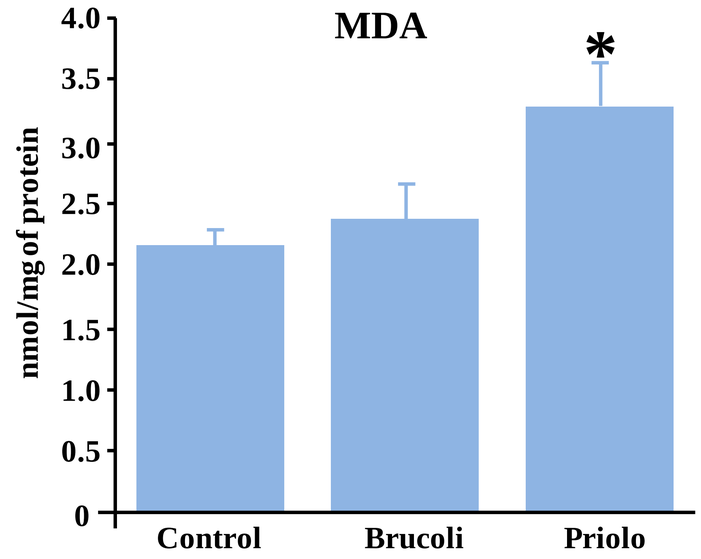

Figure 3: MDA levels in digestive gland of mussels. Bars represent mean ± SEM (n=10). * p<0.05 when compared with control and Brucoli (one-way ANOVA analysis).

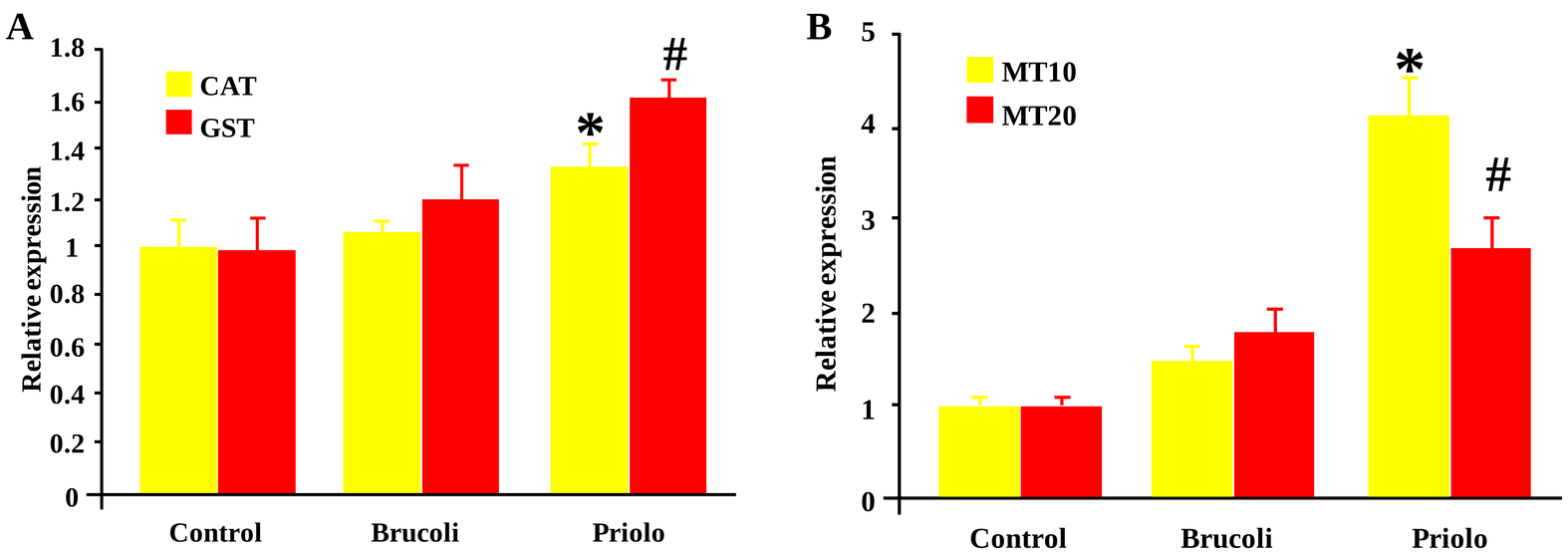

Figure 4: mRNA expressions of CAT, GST (A), and MTs (B) in digestive gland of mussels. Bars represent mean ± SEM (n=10). *,# p<0.05 when compared with control and Brucoli (one-way ANOVA analysis).

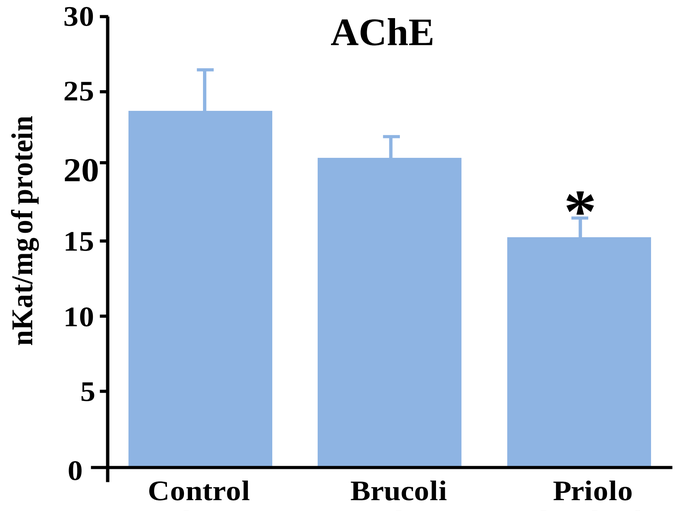

Figure 5: AChE activity in digestive gland of mussels. Bars represent mean ± SEM (n=10). * p<0.05 when compared with control and Brucoli (one-way ANOVA analysis).

In **conclusion**, the pollution associated with the petrochemical industrial area (mainly PAHs and heavy metals) caused the activation of the detoxification and antioxidant defense systems in the digestive gland of the mussels *M. galloprovincialis*, indicative of oxidative stress. This study provides further evidence of the criticality representing harbor areas, due to the presence of xenobiotics in high concentrations, which can be accumulated in sediments and in living organisms due to the limited hydrodynamic inside harbors.

References

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