TRACE METALS IN THE SHELL OF THE MEDITERRANEAN MUSSEL *MYTILUS GALLOPROVINCIALIS*

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Marine bivalves are known to accumulate high levels of metals in their tissues and are commonly used in biomonitoring studies. An alternative approach to the analysis of metals in soft tissues may be the use of shell which would allow also the comparison with fossil samples. However, since the processes regulating metal accumulation in the shell remain still unclear, further research is needed to validate the use of this structure in monitoring programs.

The aim of this work was a preliminary characterization of trace metal levels in the shell of the Mediterranean mussel *Mytilus galloprovincialis*, the distribution of these elements among the various mineralogical components and the influence of organism size on metal levels in the shell.

Mussels were collected respectively from a clean and a trace metal polluted area of North Tyrrhenian Sea; after removing soft tissues, the shells were cleaned with a nylon brush and dried at 45°C until constant weight. Metals were determined in whole shells, in shells without the periostracum and in the calcite and aragonite phases. Periostracum was removed by solubilization in 20% Tetramethylammonium hydroxide (TMAH) at 60°C for 3 h; calcite and aragonite components were separated (after a preliminary treatment with TMAH) at 400°C for 1 h. Samples were digested with concentrated nitric acid and metals determined by atomic absorption spectrophotometry. The standard addition method was used to eliminate matrix effects. The influence of organism size on trace metal concentrations was assessed in mussels from both the populations by analysing whole shells of different size classes.

Metal concentrations in the shell of mussels from Scarlino (polluted site) and La Spezia (clean site) are reported in Table 1. Previous studies on trace metal concentrations in soft tissues of mussels from both the populations indicated, for Scarlino, high environmental levels especially of Mn, Pb and Fe (REGOLI, 1992; REGOLi and ORLANDO, 1993, 1994a,b).

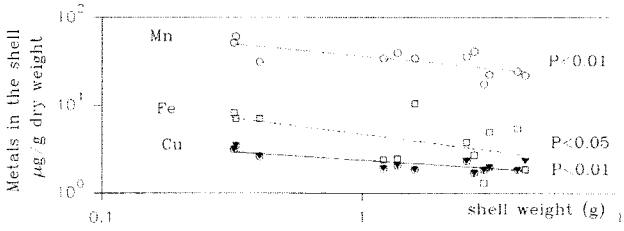
These findings were partially confirmed by data on shell analysis which showed higher concentrations of Mn and especially of Pb in mussels from Scarlino. On the other hand, no statistical difference was observed for Fe in whole shells of mussels from the two populations. This fact could be explained hypothesizing that iron, mainly present in seawater as oxide-hydroxide compounds, cannot be secreted, in this chemical form, into the extrapalleal fluid. Similar values of Cu and Zn in whole shells of mussels from both the populations agree with data previously reported for soft tissues.

The removal of periostracum generally reduced the concentrations of metals (with some exceptions) indicating an important contribution of this component to the total metal burden in the shell. The distribution of metals in calcite and aragonite differed according to the element, but was rather similar in mussels from the two populations.

Table 1. Trace metal concentrations (g/g dry weight)) in different mineralogical components of shell in *Mytilus galloprovincialis* from a polluted (Scarlino) and a clean (La Spezia) site. (Mean values standard deviations, n=5)

Metal	Site	Whole shells	Shells without periostracum	Calcite	Aragonite
Mn	Scarlino	27.0±8.66	15.1±2.92	11.4±5.72	1.84±0.97
	La Spezia	6.08±2.25	5.58±2.22	7.66±1.99	1.13±0.53
Fe	Scarlino	3.58±1.65	0.78±0.45	1.19±0.99	2.39±1.47
	La Spezia	2.30±1.35	0.24±0.39	1.01±0.67	4.89±4.55
Pb	Scarlino	16.6±4.04	16.4±3.80	15.5±2.74	9.77±2.26
	La Spezia	< 0.5	< 0.5	< 0.5	< 0.5
Cu	Scarlino	1.44±0.39	0.40±0.05	0.79±0.16	0.63±0.26
	La Spezia	1.50±0.17	0.38±0.09	0.61±0.21	0.85±0.57
Zn	Scarlino	0.94±0.63	0.58±0.12	0.60±0.19	0.74±0.20
	La Spezia	0.55±0.08	0.19±0.12	0.43±0.14	0.62±0.36

The influence of size on metal concentrations in whole shell resulted significant only for Mn, Fe, Cu and Zn in mussels from the polluted site (Figure 1).



From data reported in the present study, trace metal concentrations in shells seem to reflect the bioavailability of these elements in the environment, even though the variability of the results is generally higher than with the analysis of soft tissues. Shell could represent an useful tool in biomonitoring studies especially when soft tissues are not available.

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