

POSSIBLE UTILIZATION OF METALLOTHIONEIN AS A STRESS INDEX IN BIOMONITORING PROGRAMS

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In recent years, the utilization of stress indices has been proposed to evaluate the effects exerted by pollutants on marine organisms. In fact, it has been demonstrated that pollutants, such as heavy metals and organic xenobiotic compounds, can produce modifications of biochemical and physiological processes in the contaminated organisms. These alterations can be quantified by estimating the value of biological parameters whose variations may be related to the physiological status of the animals (BAYNE *et al.*, 1988; VIARENGO and CANESI, 1991).

Scope for growth, lysosomal membrane stability, histopathological alterations, DNA damage and stress proteins are among the general stress indices which reveal a stress syndrome characteristic of the response of organisms to a wide range of environmental stressors. Among the specific stress indices, reflecting responses to particular classes of contaminants, have been considered of particular interest i.e. the activity of the mixed function oxygenase system, which reveals the response of marine organisms to organic xenobiotic pollution, the acetylcholinesterase activity, which reveals the organophosphate and the carbamate insecticide pollution, the induction of imposex, utilized to reveal TBT (Tributyltin) contamination and the level of metallothioneins utilized as an indicator of the presence of heavy metals in the marine environment, which, as is known, are among the most important pollutant in coastal areas.

The evaluation of the level of metallothioneins in marine organisms has been proposed for monitoring the effects of heavy metals, since these proteins represent a response of the organisms to pollution by heavy metals such as Cu, Zn, Cd, Hg. In fact, it is well known that the enhancement of heavy metal concentration in the cells stimulates the "de novo" synthesis of metallothioneins that bind metal cations in a non-toxic form thus reducing their deleterious effects (VIARENGO and NOTT, 1993).

Utilizing the current methodologies the levels of metallothioneins can be measured with HPLC-AAS analysis or HPLC-ICP to evaluate heavy metal cations bound to metallothioneins; electrochemical and radioimmunological procedures, metal substitution assay are often utilized for the analysis of metallothionein concentrations in the cells (VIARENGO and NOTT, 1993). These procedures are often too sophisticated to be used for routine analysis of many biological samples. Recently two new methodologies for the quantification of the metallothionein concentration in the tissues of marine organisms have been developed i.e. a spectrophotometric and an electrophoretic/fluorimetric procedure. Both methods are simple, low-cost, time-saving and highly sensitive so that they could be routinely utilized in biomonitoring programs, also in those laboratories not provided with highly sophisticated instruments.

REFERENCES

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