

Various genes could be used as early biomarkers of stress due to heavy metals

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Various genes of the plant *Arabidopsis thaliana* and of the bacteria *Escherichia coli* and *Pseudomonas fluorescens* could be used as early biomarkers of stress due to heavy metals, according to the PhD thesis of María Teresa Gómez-Sagasti, researcher at Neiker-Tecnalia [The Basque Institute for Agricultural Research and Development] and the UPV/EHU-University of the Basque Country.

These new biomarkers of early exposure to <u>heavy metals</u> complement the set of biological indicators traditionally used to evaluate the impact of metal contamination on receptor ecosystems. The genes selected as toxicity biomarkers in plants and bacteria offer great potential for deployment in bioassays for evaluating environmental risk as well as in monitoring the effectiveness of remediation processes in contaminated environments.

In this PhD thesis, bioassays were conducted by exposing the model plant *Arabidopsis thaliana* and the bacteria *Escherichia coli* and *Pseudomonas fluorescens* to various toxic metals simultaneously and during short periods of time. The aim was to analyse their gene expression profiles by means of the use of DNA microarrays in order to determine the molecular changes brought about by this exposure, and to identify early biomarkers indicating toxicity due to heavy metals.

The results obtained in this PhD thesis, supervised by José María Becerril-Soto (UPV/EHU) and Carlos Garbisu-Crespo (Neiker-Tecnalia), have contributed towards increasing current knowledge about



the molecular bases of the mechanisms involved in metal tolerance and toxicity in *Arabidopsis thaliana*, *Escherichia coli* and *Pseudomonas fluorecens*.

The importance of this research lies in the fact that at a time of great environmental pressure in which growing contamination is looming as a serious threat to human and ecosystem health, the genetic/biochemical/physiological studies using model organisms are providing information of great value to evaluate and manage contaminated environments.

The deployment of remediation technologies for contaminated environments largely depends on the chemical, toxicological and ecological data provided by the assessment of environmental risk. The assessing of environmental risk requires the development of toxicological assays with model organisms with a view to clarifying the dose-effect relationships for the contaminants that are being studied.

The gene expression analyses applied to toxicological tests have made it possible to conduct an in-depth study of the response of model organisms subjected to stress as a result of heavy metals, and to provide early detection of the toxicity caused by these metal contaminants. One of the main milestones in gene expression analysis has undoubtedly been the use of DNA microarrays as diagnostic tools in the bioassays on model organisms carried out within the framework of environmental risk assessment.

Provided by Elhuyar Fundazioa

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