

Assessment of Stress-Related Gene Expression in the Heavy Metal -Exposed Nematode *Caenorhabditis elegans* : A Potential Biomarker for Environmental Risk Assessment and Metal-Induced Toxicity Monitoring

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ABSTRACT

The toxicity of cadmium, lead, chromium, and arsenite on *Caenorhabditis elegans* was investigated to identify sensitive biomarker for environmental monitoring and risk assessment. Effects of these metals on stress-related gene expression, growth, reproduction and mortality of *C.elegans* were investigated in laboratory condition. The possibility of regarding *C. elegans* as a biosensor for environmental toxicity monitoring was also tested, using a green fluorescent protein transgenic nematode. The 24-h median lethal concentrations(LC50) of cadmium, lead, chromium, and arsenite in *C.elegans* were 846, 34, 115, and 92mg/L, respectively. Cadmium exposure led to an increase in the expression of most of the genes tested. The degree of increase was more than 3 fold compared to control in heat shock protein-16.2, heat shock protein-70, metallothionein-2, cytochrome P450 family protein 35A2, glutathione-S-transferase-4 superoxide dismutase-1,

catalase-2, C.elegansp53-like protein-1, and apoptosis enhancer-1 gene. The laed-, chromium-, and arsenite-exposed nematode, on the other hand, showed little gene expression change. Alterations in growth and reproduction were observed in cadmium- and chromium-exposed worms. To consider transgenic nematode a biosensor for toxicity monitoring, the responses of stress-related gene promoters need to be tested with a variety of metals. The overall results suggest that cadmium exhibits high level of tolerance compared to the other metals tested. The use of the responses of stress-related gene expression, therefore, has considerable potential as a sensitive biomarker for the diagnosis of cadmium contamination, and C.elegans seems to be a good biological model for this approach.

Key words : Caenorhabditis.elegans, Stress-related gene expression, Biomarker, Metal toxicity monitoring, Environmental risk assessment

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