METAL-INDUCED ALTERATION IN THE EXPRESSION OF TWO HEME-OXYGENASE GENES

Zsanett Jancsó, Krisztina Dugmonits, Edit Hermesz

University of Szeged, Faculty of Science and Informatics, Department of Biochemistry and Molecular Biology, P.O.Box 533, Szeged H-6701, Hungary
jazlaat@gmail.com

Introduction: Heme-oxygenases (HOs) are rate-limiting enzymes in the heme catabolic pathway. HOs play role in the heme degradation, and also produce carbon monoxide, a vasoactive dilator agent with important free radical scavenger properties. Rapid upregulation of *ho* genes in response to heavy metal exposure is a protective mechanism preventing free radical accumulation.

Materials and methods: Expression of *ho* genes was assessed by reverse transcription coupled polymerase chain reactions (RT-PCR) in different tissues of untreated and metal (Cd^{2+} and As^{5+}) exposed common carp (*Cyprinus carpio)*. Cd^{2+} and As^{5+} were employed in two concentrations (1 or 10 mg/l). Cd^{2+} accumulation in the tissues was determined with atomic absorption spectrophotometry.

Results: cDNA library was generated using total RNA as a template from carp liver. cDNA clones carrying the coding region of HO-1 and HO-2 were screened for and sequenced. Gene-specific primers were designed and used to measure the *ho-1* and *ho-2* mRNA levels in different tissues (brain, liver, kidney, heart, skin, spleen, blood, gill and muscle). The basal level of the inducible *ho-1* transcript is on the edge of detectability in most of the examined tissues, except in skin, spleen and blood. The *ho-2* gene is constitutively expressed at a relatively high level in all the tissues examined. The highest level was detected in the skin, blood, spleen, heart and brain but it was less expressive in kidney and liver.

Alterations in the level of gene specific mRNAs were followed after exposure to Cd^{2+} and As^{5+}. In the kidney, the two metals had similar effect on the expression of both genes. On the contrary, in the liver only high dose of Cd^{2+} induced *ho-1* expression, while As^{5+} treatment resulted in a similar *ho-1* mRNA level at a low but not at a high concentration.

Conclusion: The expression of *ho* genes are gene- and tissue-specific under physiological condition. Heavy metal (Cd^{2+} and As^{5+}) exposure alters gene expression in a gene- tissue-, dose and metal-specific manner.

The publication/presentation is supported by the European Union and co-funded by the European Social Fund. Project title: "Broadening the knowledge base and supporting the long term professional sustainability of the Research University Centre of Excellence at the University of Szeged by ensuring the rising generation of excellent scientists."
Project number: TÁMOP-4.2.2/B-10/1-2010-0012