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Molecular Biological Analysis of Fish Behavior as a Biomonitoring System for Detecting Diazinon

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The goal of this study is to develop a biomarker used in monitoring abnormal behaviors of Japanese medaka (*Oryzias latipes*) as a model organism caused by hazardous chemicals that are toxic and persistent in the ecosystem. A widely used insecticide, diazinon (O, O-diethyl O-(2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothioate), is highly neurotoxic to fish, and it is also well known that it causes vertebral malformation and behavioral changes of fish at relatively low concentrations. The fish behaviors were observed on a real time basis using an image processing and automatic data acquisition system. The genes potentially involved in the abnormal behaviors were cloned using suppression subtractive hybridization (SSH) technique. The untreated individuals showed common behavioral characteristics. When the test fish was affected by diazinon at a concentration of 0.1 and 1 ppm, some specific patterns were observed in its behavioral activity and locomotive tracks. The typical patterns were enhanced surfacing activity, opercular movement, erratic movement, tremors and convulsions as reported previously. The number of genes up-regulated by diazinon treatment were 97 which includes 27 of unknown genes. The number of down-regulated genes were 99 including 60 of unknown genes. These gene expression patterns will be analyzed by the artificial neural networks such as self organization map (SOM) and multilayer perceptron (MLP), revealing the role of genes responsible for the behaviors. These results may provide molecular biological and neurobehavioral bases of a biomonitoring system for diazinon using a model organism such as fish.