Analysis of Impacts of toxic chemicals using DNA chip based gene expression pattern analysis and Recombinant Bioluminescent Bacteria

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Abstract

The DNA microarray provides a rapid and cost effective method to show specific cellular response with unique gene expressions 1). Through the analysis of gene expression profiles obtained from the samples treated with toxic chemicals, the mode of toxic action or nature of a chemicals' toxicity may be predicted using a comparison of the sample's expression profiles with a database. To test this theme, we used the *E. coli* DNA microarray and recombinant bioluminescent *E. coli*. The *E. coli* and recombinant strains were treated with phenolics, hydrogen peroxide, paraquat and some DNA damaging chemicals. The RNA was isolated from both treated and untreated cells, and an RT reaction was performed with the fluorescent dyes, Cy3 (control) and Cy5 (sample). Our results indicate that the expression patterns induced by phenolics, DNA damaging chemicals, hydrogen peroxide, or paraquat were distinct and different for each case. Especially, for the DNA damaging chemicals, only SOS regulon related genes were highly induced. Hydrogen peroxide induced several genes related with hydrogenases, while phenolics induced several genes related with membrane binding proteins. Also, some of the genes that were highly induced were compared with the bioluminescent expression from recombinant strains that have fusions of the *lux* operon with the promoter of that gene.

Gene expression profiling from the DNA microarray and the responses of the recombinant bioluminescent strains when exposed to toxic chemicals can be used in concert with each other as new toxic biosensors.

References

1. G. Orphanides (2003), Toxicogenomics : challenges and opportunities, *Toxicology Letters* **140-141**, 145-148.
2. William D. Pennie (2002), Custom cDNA microarrays; technologies and applications, *Toxicology* **181-182**, 551-554.