DNA chip analysis for Identification of a new cellular stress gene, *gltA* and its use in construction of recombinant bioluminescent bacteria, *gltA::luxCDABE*

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Abstract

DNA microarray technology, a high-throughput gene expression analysis tool that causing deep impacts on the progress of biotechnology nowadays, can be implemented in many different areas of research. One of important implication is to use DNA chips to find specific genes of interest based upon their expression compared to control. In this study, a Takara *E. coli* DNA chip was used for analyzing the *E. coli* cells treated with 2,3,7,8-tetrachlorodibenzodioxins (2,3,7,8-TCDD), which is known to be the most toxic chemical man made. From the expression analysis of this DNA chip, it was found that citrate synthase (*gltA*) gene, the first enzyme involved in TCA cycle, was expressed more than seven-fold higher than control. Therefore, a plasmid containing *gltA* promoter transcribing *Photorabdus luminescens luxCDABE* genes (*gltA::luxCDABE*) was successfully constructed and a new recombinant bioluminescent bacteria, EBJM2, was finally transformed. This new biosensing bacterial strain seems to respond to DNA-damaging stresses such as mitomycin C (MMC) and methyl-nitro-nitrosoguanidine (MNNG) very sensitively, but no significant induction has been found with either oxidative- or protein-damaging stresses. This result is strongly supported by the fact that 2,3,7,8-TCDD caused DNA damages mainly in our previous experiments (1). Therefore, we prospect that use of DNA chips in search for new biomarker genes accelerate findings of new functional genes, especially for toxico-genomic and cellular stress monitoring studies.

References

1. J. Min, C. H. Pham, and Man Bock Gu (2003), Specific responses of bacterial cells to dioxins, *Env. Toxicol. Chem.* **22**, 233-238.