

A Cell Array Biochip for Oxidative Toxicity Analysis

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A cell-based array technology using numerous recombinant bioluminescent bacteria, which can be used to detect and classify environmental toxicities, has been implemented to develop cell array biochips in this study. Each strain was immobilized in the wells of a plastic array (96 spots) using LB-agar as the matrix and for maintenance of bacterial viability. The capability of the cell chip for analyzing oxidative toxicity was examined by using nine chemicals that can be categorized according to their structure and radical production; (a) paraquat, an active radical producer, (b) the structural analogs of paraquat that produce radicals, (c) chemicals that are distinct to paraquat but still produce radicals and (d) chemicals having similar structure as paraquat but do not produce radicals. In spite of structural similarity of chemicals, the bioluminescent responses were critically affected by radical production. Moreover, specific bioluminescence signals were obtained from the cell chips to specific category of chemicals. It means that the cell chip can sensitively respond to even small difference in chemical nature. Finally, a new strategy for analyzing unknown sample to identify its structure and toxicity is proposed based on the unique response obtained from this cell chip.