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Electrochemical Biosensing of Salicylate by Recombinant *Escherichia coli* Cells Immobilized in Polyvinyl Alcohol Beads

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Electrochemical measurement of salicylate was performed using recombinant *Escherichia coli* cells immobilized in polyvinyl alcohol (PVA) beads. Among aromatic hydrocarbons, salicylate is chosen as a model compound because it is less toxic than other aromatic hydrocarbons and soluble in water. Recombinant *E. coli* cells carrying *nahR* (encoding the NahR regulatory protein for naphthalene and salicylate degradation)::*lacZ* fusion genes were constructed, immobilized in PVA beads and induced with salicylate, and their biosensing activities were electrochemically monitored using *p*-aminophenyl-β-D-galactopyranoside (PAPG) as the enzymatic substrate. The redox response of *p*-aminophenol (PAP), a catabolite of PAPG, was measured by either cyclic voltammetry (as the peak current) or chronoamperometry (as the steady-state current). Various parameters were characterized, including optimum reaction conditions, substrate concentrations, selectivity, repeatability, and stability. Under optimum conditions, the sensor showed a good lower detection limit (30 nM salicylate) and selective response to salicylate. The responses were reliably repeatable with an acceptable standard deviation (±4.5%; n = 5), and the system showed good stability, with 80–100% activity remaining after 7 h of operation or 2 weeks of storage at 4 ℃. This system has advantages over existing optical techniques, including better speed and a lower detection limit.

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