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Direct Monitoring of Glutamate Released from Cerebellar Neurons Using Platinized Carbon Disk Microelectrode Modified with Glutamate-Oxidase-Bound Membrane

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A glutamate microsensor was fabricated by immobilizing glutamate oxidase on a platinized carbon disk (PCD) microelectrode by entrapment with poly(vinyl alcohol)-quaternized stilbazole (PVA-SbQ). These enzyme-bound PCD electrodes, approximately 20 μm in diameter, detect hydrogen peroxide produced by the oxidase enzyme reaction of glutamic acid. The lower detection limit for this electrode using a pulsed potential was 2 μM of glutamate (0.2 μM of hydrogen peroxide), and a linear calibration range from 2 μM to 1.2 mM of glutamate concentration (0.2 μM to 2 mM of hydrogen peroxide) was obtained. We demonstrate the application of the PCD electrode microsensor to monitor glutamate released *in vitro* within molecular layers of rat cerebellar cortex tissue. In this experiment, depolarization-induced release of glutamate by calcium ions was observed. The electrode sensor equilibrium response time was 10 seconds for the measurement of glutamate released from cerebellar cortex neurons.

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