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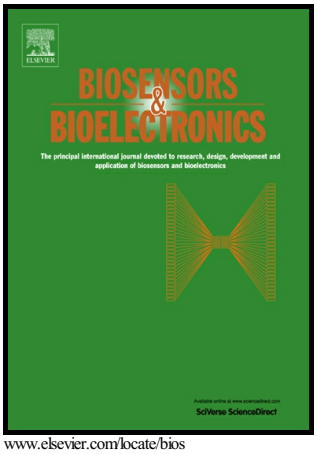

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A silicon based implantable microelectrode array for electrophysiological and dopamine recording from cortex to striatum in the non-human primate brain

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Abstract

Dual-mode, multielectrode recordings have become routine in rodent neuroscience research and have recently been adapted to the non-human primate. However, robust and reliable application of acute, multielectrode recording methods in monkeys especially for deep brain nucleus research remains a challenge. In this paper, We described a low cost silicon based 16-site implantable microelectrode array (MEA) chip fabricated by standard lithography technology for in vivo test. The array was 25 mm long and designed to use in non-human primate models, for electrophysiological and electrochemical recording. We presented a detailed protocol for array fabrication, then showed that the device can record Spikes, LFPs and dopamine (DA) variation continuously from cortex to striatum in an esthetized monkey. Though our experiment, high-quality electrophysiological signals were obtained from the animal. Across any given microelectrode, spike amplitudes ranged from 70 to 300 μV peak to peak, with a mean signal-to-noise ratio of better than 5:1. Calibration results showed the MEA probe had high sensitivity and good selectivity for DA. The DA concentration changed from 42.8 to 481.6 μM when the MEA probe inserted from cortex into deep brain nucleus of striatum, which reflected the inhomogeneous distribution of DA in brains. Compared with existing methods allowing single mode (electrophysiology or electrochemistry) recording. This system is designed explicitly for dual-mode recording to meet the challenges of recording in non-human primates.

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