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Abstract Preview

New Deep Brain Stimulation System and Behavioral Changes of Freely Moveable Rats Parkinsonian Models

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Since the first pioneering work on high-frequency deep brain stimulation (DBS) of subthalamic nuclei (STN) in late 1980s, so many evidences have been accumulated that STN-DBS can produce dramatic alleviations of motor symptoms of advanced Parkinson's disease (PD) in both animals and humans studies. It is true that commercialized DBS system proffers excellent curative value, but the system is not fully optimized yet in many ways. This paper proposes the next generation DBS system: 1) Rechargeable, 2) Head-mountable DBS system. To realize the proposed system, neural current stimulation chip, wireless data and power transmitter/receiver, and miniaturized hermetic package are developed. The current stimulation chip could generate biphasic stimulus pulses for about 1 month with coin type Li-ion battery of 75 mAh capacity. And the Li-ion battery could be recharged with inductive coil coupling. Brazed and sol-treated hermetic package shows preferable leak rates of 1.0×10-10 sccs below. We verified short-term biocompatibility of crystallized SiO2 sol layer by cell culturing of rat's hipocampal neurons. To demonstrate the efficacy of STN-DBS, systematical and comprehensive behavioral studies are conducted with parkinsonian rat model. Several useful tools for animal study were also developed. With the tools, the experimental environment could be maintained stably for over 2 months. We observe the improvements of motor deficits in the models. And we also demonstrated neuropathic pain could be alleviated by electrical stimulation.

Keywords : Deep Brain Stimulation, Parkinson's Disease, Next Generation DBS System