

DBS - from a viewpoint of system neurophysiologist

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Deep brain stimulation (DBS) that applies electrical stimulation to deep brain structures is an effective therapy for movement disorders such as Parkinson's disease (PD), but its detailed mechanisms still remain to be elucidated. By recording neuronal activity in PD model animals, we found that PD symptoms are caused by decreased information flow through the *direct* pathway and increased information flow through the *indirect* pathway in the basal ganglia, and that DBS blocks information flow at the stimulating site.

To improve the methods of DBS and expand its application, the following studies are necessary: 1) changes in information flow through the affected brain regions in various neurological disorders; 2) simulation of DBS; 3) differences in the mechanisms between classical stereotactic surgery and modern DBS. For that purpose, I would like to propose the followings: 1) participation of increased number of basic researchers who study pathophysiology of neurological disorders, clinicians who are interested in basic neuroscience, and engineers who understand biology; 2) cooperation between neurologists and neurosurgeons in the clinical practice of DBS; 3) participation of psychiatrists to expand the application of DBS to psychotic symptoms; 4) partnership with medical industries to improve DBS devices.