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How does an Electrically-Induced Stimulation of Neuronal Elements Propagate in the Brain?

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Abstract: Electrical stimulation (ES) of the brain has been performed for over 100 years, and although some might say it is a crude technique for understanding the detailed mechanisms underlying different neural computations, microstimulation has made significant contributions to our knowledge in both basic and clinical research. Recently there has been resurgence in its use in the context of electrotherapy and neural prostheses. For example, ES has made it possible to at least partially restore hearing to deaf patients by delivering pulses via implanted electrodes to different regions of the cochlea. Stimulation of the basal ganglia is remarkably effective in restoring motor function to Parkinson's patients, and microstimulation of the geniculostriate visual pathway is regarded by some as a very promising (future) method for making the blind see again.

Yet, the methodology still suffers from at least two fundamental problems; (a) we do not always know exactly what is being stimulated when we pass currents through the tissue; and (b) stimulation causes activation in a large number of areas even outside the stimulation site, making it difficult to isolate and evaluate the behavioral effects of the stimulated area itself. Microstimulation during fMRI (esfMRI) could provide a unique opportunity to visualize the networks underlying electrostimulation-induced behaviors, to map neuromodulatory systems, or to develop electrotherapy and neural prosthetic devices. Moreover esfMRI is an excellent tool for the study of the effects of regional synaptic plasticity, e.g. LTP in hippocampus, on cortical connectivity. Last but not least, esfMRI can offer important insights into the functional neurovascular coupling. In my talk, I shall discuss findings from recent and on-going work on signal propagation during electrical stimulation, as well as data related to effective connectivity.

Más información: http://www.ft.uam.es/docencia/seminarios.html