Neuronal identification by fluorescence spectrogram, and the application to auditory neural circuits in vivo

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【Outline of survey】

This project tries identifying molecular characteristics of neurons by detecting fluorescence that is evoked through a quartz glass electrode; then by using the same glass electrode the electrical activity of the neuron will be recorded. We are particularly interested in the function of inhibitory neurons in the auditory brain activity. Inhibitory neurons are expected to regulate variety of neuronal activities. However, exact roles of inhibitory neurons were not much known because of the difficulty of differentiating activities of them from those of excitatory neurons. On the other hand, a genetically engineered mouse is already available which has GFP labeled on inhibitory neurons. Therefore, this research project aims first to identify these GFP labeled inhibitory neurons in the auditory midbrain nuclei by fluorescence spectrogram. Although the methodology could be expanded widely in the analyses of fluorescence labeled neurons such as FRET molecules in the brain, we will first apply this method in the investigation of the roles of GFP labeled inhibitory neurons in auditory circuits on which we have a lot of experience.

【Expected results】

This research will develop a methodology to detect molecular identity of neurons in vivo by fluorescence spectrogram; then electrophysiological experiments will be conducted on the identified neurons. The strategy will facilitate the functional understanding of neural circuits in the brain. The technique will also facilitate experimental usage of already made many genetically engineered mice which have fluorescence labeled neurons such as by GFP and FRET molecules. Overall, the outcome of recent advancement of molecular biology will be effectively adopted in neurophysiological researches in the brain, and will facilitate our understanding of the brain.

【References by the principal investigator】

・Kenji Takatsuka et al (2005). A novel Ca2+ indicator protein using FRET and calpain-sensitive linker. Biochemical and Biophysical Research Communications 336: 316-323.
・Nishino E et al (2008).Sound intensity-dependent compensation for the small interaural time difference cue for sound source localization. Journal of Neuroscience (in press)

【Term of project】 FY2008－2012	【Budget allocation】 127,100,000 yen (direct cost)

【Homepage address】 http://www.nbiol.med.kyoto-u.ac.jp/