【Grant-in-Aid for Scientific Research(S)】

Integrated Science and Innovative Science (Comprehensive fields)

Title of Project : Mechanism governing the positioning and synaptic contacts of cortical inhibitory neurons

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Research Area : Comprehensive field

Keyword : Molecular and cellular neuroscience, Developmental and regenerative neuroscience, Neural development and its abnormality, Neurocytology

【Purpose and Background of the Research】

Higher brain functions of the cerebral cortex depend on neural networks consisting of both excitatory and inhibitory neurons. Although inhibitory neurons account for only 20% of all neurons in the cortex, they are highly diverse in their morphology, functions and molecular expression. Due to this diversity, the complicated local network containing inhibitory neurons has not been clarified yet. The goal of this project is to clarify the molecular mechanism regulating the final position of inhibitory neurons, and to comprehend the origin of the diversity of inhibitory neurons. We focus on the postulated role of environment including synaptic activity, especially from the surrounding excitatory pyramidal neurons.

【Research Methods】

This project aims for thorough understanding of the cellular mode of inhibitory neuron migration by *in vivo* real-time imaging, focusing on a late phase of migration from the marginal zone into the cortical plate. Based on these results, we plan to dissect the underlying molecular mechanisms, specifically, the role of chemoattraction / repulsion by meningeal or cortical cells. We also plan to analyze the participation of environmental factors including synaptic contacts with excitatory neurons in determining the final position of inhibitory neurons. By experimentally delaying the migration of excitatory neurons, and examine its influence on the position of inhibitory neurons, we will clarify the relationship between the synaptic contacts and the position of inhibitory neurons.

【Expected Research Achievements and Scientific Significance】

In spite of postulated importance in the information processing, studies of inhibitory neuron lag behind due to the diversity and the lack of regularity in their anatomical positions. Comprehension of the rule governing the construction of local circuits obtained through this project will shed light on the information processing in the cerebral cortex. Furthermore, the obtained knowledge will contribute to the elucidation of the etiology of the brain deficits in higher brain function.

【Publications Relevant to the Project】

Tanaka, D.H., Yanagida, M., Zhu, Y., Mikami, S., Nagasawa, T., Miyazaki, J., Yanagawa, Y., Obata, K. and Murakami, F. Random walk behavior of migrating cortical interneurons in the marginal zone: time-lapse analysis in flat-mount cortex. J. Neurosci. 29, 1300-1311, 2009

Tanaka, D.H., Maekawa, K., Yanagawa, Y., Obata, K. and Murakami, F. Multidirectional and multizonal tangential migration of GABAergic interneurons in the developing cerebral cortex. Development. 133, 2167-2176, 2006

【Term of Project】 FY2010-2014

【Budget Allocation】 166, 400 Thousand Yen

【 Homepage Address and Other Contact Information】

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