【Integrated Science and Innovative Science（Comprehensive fields）】

Molecular mechanisms for neuronal function via vesicular trafficking

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【Outline of survey】

In cells, proteins, lipids, or several molecules can travel via membrane-enclosed compartments, which are referred to transport vesicles. This membrane traffic flows along highly organized, directional routes, which allow the cell to secrete, eat, and remodel its plasma membrane.

A neuron is extraordinary above all for its enormously extended shape, with a long axon and branching dendrites connecting it through synapses to other cells. The axon and dendrites, known as neurites, enable neuron to receive, conduct, and transmit signals. To perform the specific task, neuron seems to possess a special system for vesicular trafficking. However, little is known about the precise mechanism for the neuron-specific vesicular trafficking.

During the neurite formation, membrane components are transported in a directional manner within the cell by a membrane recycling system, resulting in expansion of the cell surface area in the region of neurite formation. We isolated a novel protein protrudin, which promotes neurite formation through regulation of the membrane recycling system. It was recently shown that protrudin is also related to neuronal function as it is mutated in a neurodegenerative disease.
In this research project, we aim to elucidate the mechanisms for the regulation of the neuron-specific vesicular trafficking and the related neurodegenerative disease.

【Expected results】

This project will contribute to understanding the biological relevance of neuron-specific vesicular trafficking in neuronal function. Through this project, it is also expected the practical use of the knowledge for the clinical application in neurodegenerative disease.

【References by the principal investigator】

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- Shirane, M. and Nakayama, K. I. (2006) Protrudin induces neurite formation by directional membrane trafficking. **Science**, 314: 818-821.
- Shirane, M. and Nakayama, K. I. (2003) Immunophilin FKBP38, an inherent inhibitor of calcineurin, targets Bcl-2 to mitochondria and inhibits apoptosis. **Nature Cell Biol.**, 5: 28-37.

【Term of project】 FY2008− 2012	【Budget allocation】 **77,000,000 yen** (direct cost)

【Homepage address】 http://www.bioreg.kyushu-u.ac.jp/saibou.html