

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

### Integrated Science and Innovative Science (Comprehensive fields)



#### Title of Project : Molecular and cellular mechanisms underlying memory update system

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Research Area : Neuroscience

Keyword : Memory, Update, Association, Reconsolidation, Hippocampus, Conditioning

#### 【Purpose and Background of the Research】

Formation of knowledge is one of the bases of a human mental activity. Knowledge is not simply formed by the accurate storage of information as memory. New information is usually compared with previously stored old memories. Old memories are sometimes re-written if new information is related to the old ones (memory update). For instance, memories about an already-known person are usually modified by a new episode with that person. "Update mechanism" is necessary for the flexible adjustment to changes in environment, and becomes basic of the mental activity through the formation of knowledge.

In this study, using animal models we aim to clarify the memory update mechanisms. Memory update of three different time span will be considered: **【1】** association between two information that takes place in seconds ~ minutes ~ hours. **【2】** interaction between information that enters at intervals of days ~ month, and **【3】** rewriting by "change in the brain region where the memory is stored" that happens during week ~ month.

#### 【Research Methods】

**【1】** Update by the association of memories: Identify the memory allocation and molecules that are required for memory association *per se*. Moreover, "behavioral tag" that is related to the memory association will be analyzed.

**【2】** Update by memory reconsolidation: Analyze the molecular and cellular mechanism underlying memory reconsolidation by using a model system at the synapse level *in vivo* (hippocampal LTP) and a behavioral analysis system.

**【3】** Memory allocation: The allocation of writing and storing in various learning paradigms will be analyzed.

#### 【Expected Research Achievements and Scientific Significance】

The update mechanism of the memory is one of strategies that constructs advanced information by relating a lot of information, and an indispensable for survival of animals. In human beings, the memory update system is extremely important for the formation of knowledge. Understanding the whole image of memory update system leads not only to the understanding of the memory mechanisms but also to an approach to a philosophical proposition, for example the formation of one's character, from a natural science.

#### 【Publications Relevant to the Project】

1. Kitamura, T., Saitoh, Y., Takashima, N., Murayama, A., Niibori, Y., Ageta, H., Sekiguchi, M., Sugiyama, H. & Inokuchi, K. Adult neurogenesis modulates the hippocampus-dependent period of associative fear memory. *Cell* 139, 814-827 (2009).
2. Okada, D., Ozawa, F. & Inokuchi, K. Input-specific spine entry of soma-derived Vesl-1S protein conforms to synaptic tagging. *Science*, 324, 904-909 (2009).
3. Inokuchi K. Adult neurogenesis and modulation of neural circuit function. *Curr Opin Neurobiol*, 21, 360-364 (2011).

【Term of Project】 FY2011-2015

【Budget Allocation】 164,700 Thousand Yen

#### 【Homepage Address and Other Contact Information】

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