



Title of Project : Deciphering sugar chain-based signals regulating integrative neuronal functions

Kenji Kadomatsu
(Nagoya University, Graduate School of Medicine, Professor)

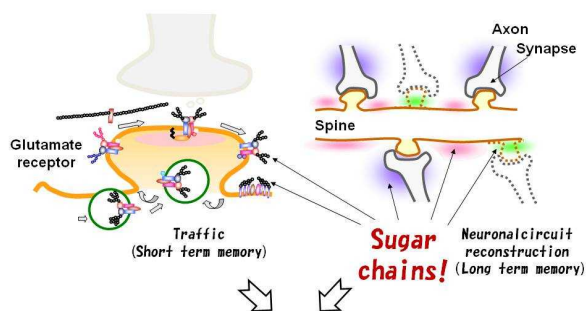
【Purpose of the Research Project】

Sugar chains are regarded as the third major biologically active macromolecule, along with nucleic acids and proteins. Japan has led the world in the field of glycobiology by elucidating complex structures and biosynthetic pathways of sugar chains. Nevertheless, how complex sugar chains regulate biological activities has remained largely unclear.

We have recently found that a small stretch of the sugar chain is responsible for the regulation of neuronal functions, and named this region the “functional domain.” Furthermore, it has become increasingly clear that sugar chains are involved in various aspects of neuronal functions, such as functional and morphological synaptic plasticity during learning and memory (Fig. 1). Thus, by focusing on these neuronal functions, we expect that we could gain clues to the mechanisms of action of sugar chains.

The goal of this project is to decipher how complex sugar chains are decoded to regulate the integrative neuronal functions. By facilitating interdisciplinary collaboration and communication, we will integrate glycobiology and neurobiology to establish a new research area “neuro-glycoscience.”

Establishment of Neuro-Glycoscience



Learning & Memory: Neuro-psychiatry diseases

Figure 1. Establishment of neuro-glycoscience

【Content of the Research Project】

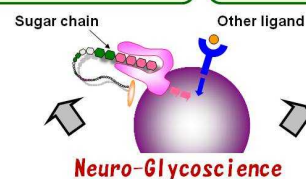
To our knowledge, this is the first trial to feature glycoscientists and neuroscientists cooperating together to accomplish collaborative research on such multiple levels. They will discuss many issues using a common platform, and will verify the mechanisms of action of sugar chains through the studies of

functional domains of sugar chains, their receptors/interacting molecules, intracellular signaling/molecular interaction, and consequent neuronal functions.

Neuro-glycoscience and future

Molecular basis and therapy for neurological diseases

Roles of sugar chains in other areas



Neuro-Glycoscience

Functional domain of the sugar chain
→Regulation of learning and memory
• Traffic of glutamate receptors
• Circuit formation and reconstruction
→Mechanisms of action of sugar chains
• Signaling mechanisms
• Cross-talk with other signaling

Figure 2. The future and influence of neuro-glycoscience

【Expected Research Achievements and Scientific Significance】

A new concept of the action mechanism of sugar chains will be established. Through an understanding of the relationship between the complexity and accuracy of neuronal functions and the complexity and dynamic changes of sugar chain structures, the novel research area neuro-glycoscience will be established. In addition, the achievements of this project are expected to influence other research areas, and to promote the understanding of diseases and the development of new therapies.

【Key Words】

Functional domain: A small stretch in the sugar chain, which is responsible for the regulation of neuronal functions.

【Term of Project】 FY2011-2015

【Budget Allocation】 1,145,400 Thousand Yen

【Homepage Address and Other Contact Information】

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