



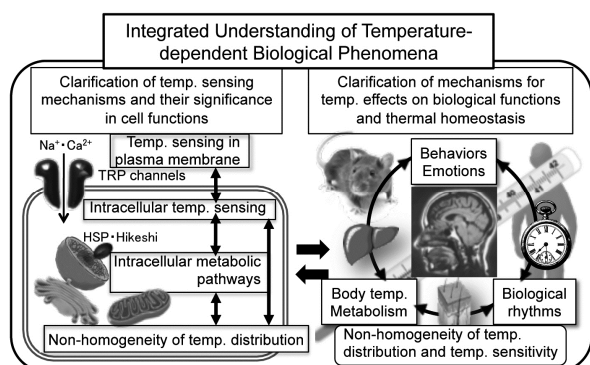
Title of Project : Integrative understanding of biological phenomena with temperature as a key theme

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【Purpose of the Research Project】

Temperature affects various physiological functions and is one of the most important factors in homeostasis. This research project concerns two subgroups, ‘temperature sensing’ and ‘temperature-responding systems’, and seeks to integrate our understanding of temperature-dependent biological phenomena with the development of techniques that detect and regulate local temperatures in cells and organs with high resolution and precision. In this project we will clarify: 1) How temperature-sensing mechanisms in the plasma membrane and in cells work together to allow precise temperature detection; 2) How temperature is sensed and integrated in temperature-dependent physiological responses that include regulation of body temperature, metabolism, biological rhythms and animal behaviors; and 3) What are the mechanisms and physiological functions of spatiotemporal non-homogeneity of temperature distribution



and detection.

Conceptual diagram of thermal biology research

【Content of the Research Project】

This inter-disciplinary research project will investigate temperature-sensing mechanisms and their involvement across a wide range of biological responses and from molecular to whole organism levels. The project will consider two subgroups, ‘A01: temperature sensing’ and ‘A02: temperature-responding systems’ to clearly address the questions of how temperature is sensed and how temperature is related to biological functions, respectively. ‘A01: temperature sensing’ addresses

temperature sensing mechanisms by focusing on plasma membrane molecules, intracellular molecules and intracellular metabolic pathways. ‘A01’ also seeks to develop ways to detect and regulate local temperatures at a cellular level, which would facilitate future temperature-sensing research. ‘A02: temperature-responding systems’ will focus on the neural circuits that integrate information concerning ambient temperature sensation, the effects of temperature on metabolic functions and biological rhythms, and mechanisms involved in emotion formation. ‘A02’ also clarifies crosstalk between temperature-responding systems by developing methods to detect and regulate local temperatures in organs. Comprehensive collaborations among the research groups will further enhance the progress of each research project.

【Expected Research Achievements and Scientific Significance】

Research that fosters an integrated understanding of temperature-dependent biological phenomena would create a novel discipline, ‘thermal biology’, which would contribute to progress in life science. Furthermore, this project could also lead to a novel concept wherein ‘temperature’ as a physical quantity could be viewed as an element of new signaling mechanisms.

【Key Words】

Thermal biology: a science in which mechanisms of temperature sensation and their involvement in physiological functions are investigated.

【Term of Project】 FY2015-2019

【Budget Allocation】 1,171,000 Thousand Yen

【Homepage Address and Other Contact Information】

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