

No. 0642

The Functions of the Sodium Sensor and Osmosensor in the Brain.

Masaharu Noda

Division of Molecular Neurobiology, National Institute for Basic Biology

Summary

Sodium homeostasis is crucial for life and Na-levels in body fluids are constantly monitored in the brain. The subfornical organ (SFO) is the center of the sensing responsible for the control of Na-intake behavior, where Na_x channels are expressed in specific glial cells as the sodium-level sensor. Here, we show direct interaction between Na_x channels and α subunits ($\alpha 1$ and $\alpha 2$ isoforms) of Na^+/K^+ -ATPase, which brings about Na-dependent activation of the metabolic state of the glial cells. The metabolic enhancement leading to extensive lactate production was observed in the SFO of wild-type mice, but not of the Na_x -knockout mice. Furthermore, lactate, as well as Na, stimulated the activity of GABAergic neurons in the SFO. These results suggest that the information on a physiological increase of the Na level in body fluids sensed by Na_x in glial cells is transmitted to neurons by lactate as a mediator to regulate neural activities of the SFO. On the other hand, the research to examine the possibility that Trpv4 and Trpv1 are the osmosensor in the brain is now in progress using the respective gene-knockout mice.