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Development of *in vivo* monitoring system to measure AVP-eGFP neuron activity and application for examination of sodium and body fluid balance

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Summary

Vasopressin, which is well known to be an antidiuretic hormone, is synthesized in the magnocellular neurosecretory cells (MNCs) in the paraventricular (PVN) and supraoptic nuclei (SON) of the hypothalamus. The MNCs terminate their axons to the posterior pituitary gland and secrete vasopressin into the systemic circulation from the axon terminals. Vasopressin release is mainly controlled by neuronal activity of the MNCs.

We generated transgenic rats expressing vasopressin-enhanced green fluorescent protein (eGFP) fusion gene. The eGFP fluorescence was clearly observed in the PVN and SON and axon terminals in the posterior pituitary gland in transgenic rats. The purpose of the present study was to establish the *in vivo* monitoring system to measure eGFP expressed in the tissue of transgenic rats. The probe for measurements of eGFP fluorescence was inserted in the posterior pituitary region of the isolated whole pituitary gland from the transgenic rats. The signal of eGFP fluorescence in the posterior pituitary gland was detected and decreased after perfusion of high potassium solution (55 mM). This means that vasopressin-eGFP was secreted from the axon terminals in the posterior pituitary by stimulation of high potassium solution. Next, we examined the effects of galanin-like peptide (GALP), which is synthesized in the pituicytes and upregulated by osmotic challenge, on eGFP fluorescence in the posterior pituitary gland by *in vivo* monitoring system. The signal of eGFP fluorescence in the posterior pituitary gland was also decreased after application of GALP in dose-related manner.

The *in vivo* monitoring system of eGFP fluorescence is a powerful tool to examine dynamic change of vasopressin release from the axon terminals in the posterior pituitary gland in vasopressin-eGFP transgenic rats. This system should be applied to the eGFP fluorescence in the hypothalamic areas under anesthetized and conscious transgenic rats.