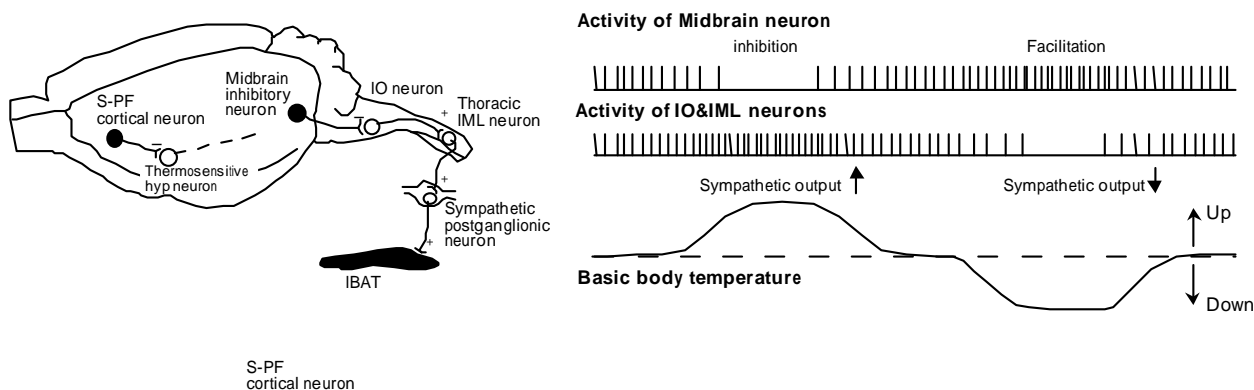


CENTRAL EFFERENT CONTROL OF NONSHIVERING THERMOGENESIS IN RATS

M. Shibata and T. Uno, Department of Biometeology, Yamanashi Institute of Environmental Sciences, Yamanashi, Japan.

As summarized in the Figure, we have recently reported that, in rats, neurons in the lower midbrain tonically inhibit nonshivering thermogenesis (NST) of the interscapular brown adipose tissue (IBAT) via inhibitory synaptic connections with the inferior olive neurons of which outputs stimulate the IBAT NST through activation of the thoracic intermediolateral (IML) neurons. Removal of the midbrain tonic inhibitory mechanism (MTIM) on the NST, therefore, increases IBAT and rectal temperatures through disinhibition-induced activation of the central sympathetic nervous system. It is, however, not known whether and how the hypothalamus exerts its influence on the MTIM. The aim of the present experiment was to examine this question using urethane - anesthetized (1.0 - 1.2 g/kg, ip) male Wistar rats. Temperatures of the rectum (T_{rec}), IBAT (T_{IBAT}) and tail skin (T_{skin}) were monitored with copper-constantan thermocouples after bilateral procaine microinjections (10%, 1.0 µl/site) into the midbrain to transiently remove the MTIM before and during hypothalamic cooling or warming in anesthetized animals. In conscious animals, procaine was also microinjected into the lower midbrain with and without decerebration. The magnitude of the midbrain procaine-induced T_{IBAT} increase was larger ($0.71 \pm 0.15^{\circ}\text{C}$) and smaller ($0.39 \pm 0.02^{\circ}\text{C}$) during hypothalamic cooling and warming, respectively, compared with that during thermoneutral hypothalamic temperature ($0.50 \pm 0.10^{\circ}\text{C}$). T_{IBAT} and T_{rec} increases by the midbrain procaine in conscious decerebrated rats reached $41.37 - 42.52^{\circ}\text{C}$ while those in non-decerebrated conscious rats were between $37.63 - 37.80^{\circ}\text{C}$. These results indicate that the hypothalamus exerts directly or indirectly its modulator influence on the MTIM.



mshibata@yies.pref.yamanashi.jp