RAPHE PALLIDUS NEURONS MEDIATE INCREASES IN BROWN ADIPOSE SYMPATHETIC OUTFLOW EVOKED BY COOLING PREOPTIC HYPOTHALAMUS

S.F. Morrison, Department of Physiology, Northwestern University Medical School, Chicago, IL, USA.

Neurons in the medial preoptic area of the hypothalamus (POAH) play an important role in sensing alterations in body core temperature and initiating autonomic and behavioral responses to return body temperature to a set point level. Disinhibition of neurons in the rostral raphe pallidus (RPa) has recently been shown to produce large increases in sympathetic nerve activity to brown adipose tissue (BAT). To begin to elucidate the pathways mediating the increases in brown adipose thermogenesis initiated to compensate for a fall in body temperature, experiments were performed to determine if an increase in the activity of neurons in the RPa was required for the stimulation of BAT sympathetic nerve activity in response to cooling of the POAH with a water-perfused thermode in rats anesthetized with an intravenous administration of urethane (800mg/kg) and chloralose (60mg/kg). For recording of sympathetic activity from nerve branches entering the ventral surface of the interscapular BAT, rats were paralyzed with tubocurarine (intravenous, 1.2 mg/kg), pneumothoracotomized and artificially-ventilated with 100% O_2. Maintenance of adequate anesthesia was determined by the absence of withdrawal reflexes between periods of paralysis. Microinjection (60 nl) of the $GABA_A$-receptor agonist, muscimol (2mM), to inhibit local neurons in RPa produced a prompt and complete reversal of the increases in amplitude and frequency of the bursts in the sympathetic nerve to interscapular BAT evoked by perfusion of a stereotaxically-positioned POAH thermode with chilled water (4^oC). Similarly, prior microinjection of muscimol into RPa prevented the increase in BAT sympathetic nerve activity normally seen upon cooling of the POAH. These data indicate that neurons in RPa are required for the excitation of the sympathetic outflow to BAT that normally increases BAT thermogenesis in response to a fall in body core temperature. Such thermogenic neurons in RPa may function as sympathetic premotor neurons providing the essential excitatory drive to sympathetic preganglionic neurons controlling BAT thermogenesis.

Supported by NIH DK-20378 and DK-57838.

s-morrison2@northwestern.edu