



# Research Week 2020

## A neural projection from the parastrial nucleus to the dorsomedial hypothalamus contributes to the activation of BAT thermogenesis

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Thermoregulation, BAT, PS, RPa, DMH

### Abstract

The parastrial nucleus (PS) is a lenticular formation located beneath the anterior commissure in the preoptic area. Anatomic and physiologic studies have demonstrated: 1) a direct projection from PS neurons to the dorsomedial hypothalamus (DMH), 2) increased cold-evoked Fos expression in PS, and 3) infected neurons in PS after injection of Pseudorabies virus into the interscapular brown adipose tissue (iBAT). However, it has not been assessed whether a specific population of PS neurons projecting to DMH is involved in the modulation of iBAT thermogenesis. We aim to determine if PS projecting neurons to DMH are selectively responsive to cold or warm stimuli, and if pharmacologic manipulation of these neurons activates iBAT thermogenesis. Two groups of male rats, previously injected with Cholera Toxin subunit-b (CTb) in DMH and FluoroGold (FG) in raphe pallidus (RPa), were respectively exposed to warm and cold ambient temperature to elicit Fos expression. A third group of rats, instrumented for recording iBAT sympathetic nerve activity (SNA) and skin and core temperature, were maintained at 38°C. Pharmacologic manipulations of PS were performed to determine whether PS projecting neurons to DMH modulate iBAT thermogenesis. Immunohistochemical analysis confirmed the existence of direct projections from PS to DMH and RPa, as well as increased Fos expression in the PS of cold-exposed rats compared to the warm-exposed group. We found that the majority of CTb-immunoreactive (ir) neurons and a small population of FG-ir neurons in PS express Fos in cold-exposed rats, suggesting the existence of an excitatory input from PS to DMH and RPa, most likely involved in the control of iBAT thermogenesis. This is consistent with the increased iBAT SNA and temperature observed after bilateral injection of the GABA-A antagonist bicuculline or NMDA in PS.