

# The PV2-nucleus of the murine midbrain and its involvement in autonomic control: immunohistochemical tract-tracing and preliminary functional studies

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The periaqueductal gray (PAG), is known to play a key role in the integration and modulation of autonomic responses (Depaulis & Bandler, 1991). It harbors two of the main terminal fields of the hypothalamic paraventricular nucleus, namely the Su3- and PV2-nuclei. The latter nucleus has not been previously described as its own entity, leading us to perform diverse studies to characterize its extent, connections and gene expression. The PV2-nucleus is an elongated cluster composed of 475 parvalbumin-expressing neurons, located in the ventromedial region of the distal periaqueductal gray. Using anterograde tracing methods, the main projections of the PV2-nucleus were found to innervate the Su3-nucleus of the PAG, the paraventricular nucleus of the lateral hypothalamus, the gemini nuclei of the posterior hypothalamus, the septal regions and the diagonal band in the forebrain, as well as various nuclei within the reticular formation in the midbrain and brainstem. Within the brainstem, projections were discrete, but involved areas implicated in autonomic control. The PV2-nucleus expressed various peptides and receptors, including the receptor for Adcyap1, a peptide secreted by one of its main afferences, namely, the paraventricular nucleus. Expression of Vgat-1 in a subpopulation of PV2-neurons indicates an inhibitory nature of a fraction of the nucleus. Furthermore, an experiment was conducted to determine the possible function of the PV2 in a circuitry involving the orbitofrontal cortex, the paraventricular nucleus and the Su3-nucleus. While these studies suggest an involvement of the circuitry in cardiovascular control, the precise functions could not be conclusively deduced.

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