

DOES THE MIDBRAIN DORSOLATERAL PERIAQUEDUCTAL GREY HAVE DIRECT CONNECTIONS WITH THE PONTINE A5 REGION? A NEUROPHARMACOLOGIC AND ELECTROPHYSIOLOGICAL STUDY

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ABSTRACT

This study has been performed in spontaneously breathing anesthetised rats. We have analysed the possible interactions between the midbrain dorsolateral periaqueductal grey matter (dIPAG) and the pontine A5 region. Electrical stimulations of the dIPAG (1 ms pulses, 20-30 µA given at 100 Hz for 5s) were elicited and the evoked cardiorespiratory changes were analysed before and after ipsilateral blockade of the neurotransmission within the A5 region by means of microinjections of muscimol (50 nl, 0.25 nmol, 5s). Electrical stimulations evoked the classical “defence response” characterized by tachipnoea, hypertension and tachycardia. Tachipnoea consisted of an inspiratory facilitatory response [increase in respiratory rate ($p<0.001$) due to a decrease in expiratory time ($p<0.01$)] and was accompanied by a pressor ($p<0.001$) and tachycardic ($p<0.001$) response. Muscimol microinjected within the A5 region reduced pressor ($p<0.05$), tachycardic ($p<0.001$) and tachypnoeic ($p<0.001$) responses evoked to dIPAG electrical stimulations. Finally, in order to assess functional interactions between A5 and dIPAG, extracellular recordings of 40 putative A5 cells during dIPAG electrical stimulation were recorded. 16 cells were affected by dIPAG stimulation (40%). 3 cells showed orthodromic activation (14.2 ± 1.7 ms). 5 cells were excited (10.1 ± 1.6 ms). 7 cells decreased spontaneous activity to dIPAG stimulation. 24 cells were not modified by dIPAG stimulation (2 presented a respiratory pattern and 1 presented a cardiovascular pattern).

These results contribute with new data on the role of the A5 region neurones in the modulation of the cardiorespiratory response evoked on dIPAG stimulation.

Keywords: A5 region; dorsolateral periaqueductal grey matter; Respiratory control; Cardiovascular control; Rat.