

Role of dorsomedian nucleus of hypothalamus in stress-induced hyperalgesia: A possible mechanism for anxiety-induced orofacial pain

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Background and Aims: The present study was designed to evaluate the effect of disinhibition of dorsomedian Nucleus of hypothalamus (DMH) on thermal and chemical nociception of freely moving rodents.

Methods: male wistar rats were used for these experiments. A guiding cannula was placed in their DMH (coordinates obtained from Paxinos-Watson atlas), after a one-week period of healing, rats were microinjected with bicuculline (BIC) as a GABA_A antagonist (10 pg/100 nL) or saline (100 nL). Their reaction time to thermal stimuli (53.5°C) was recorded with hot-plate test within an hour after injection in 5-min intervals, and their response to chemical stimuli was evaluated by applying 5M NaCl to their cornea and counting the number of eye-wipings in a 30s interval for an hour (eye-wiping test). Animal's heart rate and blood pressure was recorded to verify disinhibition of DMH. Data were analyzed using Repeated measures test, $p < 0.05$ was considered significant.

Results: animals receiving BIC into their DMH showed a robust increase in their blood pressure and heart rate within an hour after injection ($p < 0.05$). Disinhibition of GABA_A receptors led to a decrease in reaction time in hot plate test ($p < 0.01$), simultaneous with an increase in eye-wipings number ($p < 0.05$), demonstrating a decreased pain threshold in trigeminal pain pathways along with somatosensory pathways. Administration of Saline to DMH did not alter blood pressure, heart rate or pain thresholds ($p > 0.05$).

Conclusions: This study showed the role of DMH in hypersensitivity to noxious stimuli following an emotional stress. Disinhibition of DMH led to a decreased pain threshold in both trigeminal and somatosensory pathways. These findings suggest an important role for DMH in pain threshold alterations following emotional stress in trigeminal pain pathways, thus exhibiting a possible mechanism for emotional stress- Induced chronic orofacial pain.

Keywords: Dorsomedian Nucleus of hypothalamus (DMH); Orofacial Pain; Stress-induced hyperalgesia (SIH)