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Autonomic Responses to Periaqueductal Grey Stimulation During Inhibition of Tail Flick Response in Rats

T. A. Lovick and J. E. Cairns

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By T. A. Lovick and J. E. Cairns

Department of Physiology, The Medical School, Birmingham B15 2TJ, U.K.

The analgesic effects evoked by stimulating midbrain sites are well known but electrical stimulation in the periaqueductal grey matter (PAG) can also produce aggressive or defensive behaviour which is accompanied by a characteristic pattern of autonomic changes termed the 'defence reaction' (Abrahams *et al.* 1960) or 'visceral alerting' (Hilton *et al.* 1983).

The pattern of autonomic responses also occurs in stressful situations (Martin *et al.* 1976), and stress itself is a factor that can produce analgesia (Hayes *et al.* 1978). To assess whether there could be a common neural substrate which mediates both the autonomic and analgesic effects evoked by stress we have compared the cardiovascular, respiratory and analgesic effects elicited by midbrain stimulation in rats.

Blood pressure, heart rate, blood flow to hindlimb muscle and respiration were measured, as well as the latency of the tail flick response to radiant heat in rats anaesthetized with Saffan (Glaxovet, 9–12 mg kg^{-1} h). Monopolar electrical stimulation (40–100 μA, 0.5 ms, 80 Hz for 10 s) in the PAG on a level with, or dorsal to the aqueduct evoked a pressor response, tachycardia, vasodilatation in hindlimb muscle and an increase in rate and/or depth of respiration with pupillodilatation and widening of the palpebral fissure. At the same time the latency of the tail flick response increased, usually up to the cut off value of 9 s, set to prevent damage to the tail. In contrast, stimulation in the ventral PAG or in the tegmentum ventral or lateral to it produced analgesia but without visceral alerting.

Both the autonomic and the analgesic effects of stimulating the dorsal PAG were blocked after bilateral lesions of the ventrolateral medulla, in the region immediately lateral to the pyramids, between the level of the facial nucleus and the obex.

We suggest that the analgesia evoked by stimulating the dorsal part of the PAG is but one component of a highly integrated response to stress whose efferent pathway runs through the ventrolateral medulla.

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