

**Intracranial self-stimulation and noradrenaline metabolism in cortex**

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Electrical self-stimulation in rats with electrodes implanted in the region of the IVth ventricle is associated with the site of the electrode tip being close to the locus coeruleus (LC) and the mesencephalic root of the trigeminal nerve (Crow, Spear & Arbuthnott, 1972). Electrical stimulation of the same region causes a rise in the level of 4-hydroxy-3-methoxy-phenyl glycol (HMPG) in rat cerebral cortex (Walter & Eccleston, 1972), presumably through the activation of the noradrenaline containing cells of LC which project to the cerebral cortex.

Bipolar stainless steel electrodes were stereotactically implanted in the region of the left locus coeruleus of female Hooded Lister rats. Animals showing a self-stimulation response were divided into two groups. One group was operator-stimulated under halothane anaesthesia for 1 h and the other group was allowed to self stimulate in the conscious state for 1 hour. Animals in a further group which did not self stimulate were operator-stimulated under halothane anaesthesia for 1 hour. A control group with implanted electrodes was not stimulated.

Electrical stimulation of the anaesthetized animals was chosen to mimic the stimulation of the conscious animals and consisted of 200 ms trains of 0.5 m pulses at 100 Hz repeated once every 4 seconds.

Total (free plus conjugated) HMPG in the left and right cerebral cortices was estimated by gas-liquid chromatography as the acetyltrifluoroacetyl derivative (Walter & Eccleston, in preparation). Histological location of the electrode tip position was made in tissue stained by the Klüver & Barrera (1953) technique.

TABLE 1.

Procedure	Type of experimental rat	ng/g total HMPG	
		Left cortex	Right cortex
Unstimulated controls		151 ± 38* (7)	141 ± 36 (7)
Operator-stimulated under halothane anaesthesia	Non self-stimulating	159 ± 28 (5)	149 ± 15 (5)
Self-stimulation in conscious state	Self stimulating	328 ± 56† (3)	175 ± 30 (3)
	Self stimulating	251 ± 21† (6)	206‡ ± 40 (6)

Total HMPG (free + conjugated) in left and right cerebral cortex. All animals had stimulating electrodes implanted in the left locus coeruleus.

\*Mean ± S.D. (number of animals). † $P < 0.0005$  (single tailed  $t$  test). ‡ $P < 0.01$  (single tailed  $t$  test).

The mean concentration of total HMPG in cerebral cortex was found to be  $146 \pm 38$  ng/g (mean, S.D. of mean). The results of 1 h of electrical stimulation on the level of cortical HMPG are summarized in Table 1. Animals exhibiting a self stimulation response showed a marked increase of total HMPG after 1 h of remote electrical stimulation or self stimulation. Electrical stimulation of the group which did not exhibit a self stimulation response produced no change in the level of HMPG in the cortex.

These results suggest that stimulation of noradrenergic nerves arising from locus coeruleus is necessary for the phenomenon of self stimulation.

## REFERENCES

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