A pharmacological technique for investigating the function of centrifugal auditory pathways in cat

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The majority of centrifugal pathways within the cat auditory pathway run near or within fibre bundles which also contain centripetal fibres (Rasmussen, 1964; 1967). The method employed to investigate the functional properties of these pathways must alter selectively the activity of one or more centrifugal pathways while leaving the centripetal system relatively intact. In view of the complex anatomy the classical technique of surgical ablation is therefore not applicable. A certain amount of information has been gathered with regard to the pharmacological properties of certain centrifugal pathways terminating within the cochlear nucleus (Whitfield, 1968; Comis & Whitfield, 1968; Comis, 1970). The present technique therefore makes use of drugs which are known to either activate, block or destroy nerve terminals and synapses of certain centrifugal pathways within the cochlear nucleus, while leaving the centripetal pathways unaffected.

Cats are trained to avoid a shock in a grille box when a particular sound stimulus is presented. This method is being used to measure the threshold of a 1 KHz tone in the presence or absence of white noise. When the cats have been trained to criterion, a cannula is inserted under Nembutal anaesthesia so that the tip of the cannula lies in the space between the paraflocculus and cochlear nucleus (see Fig. 1). The contralateral middle ear apparatus is immobilized with dental cement. When the animals recover sufficiently from surgery they are run in the grille box before and following the application of drugs on to the surface of the cochlear nucleus.

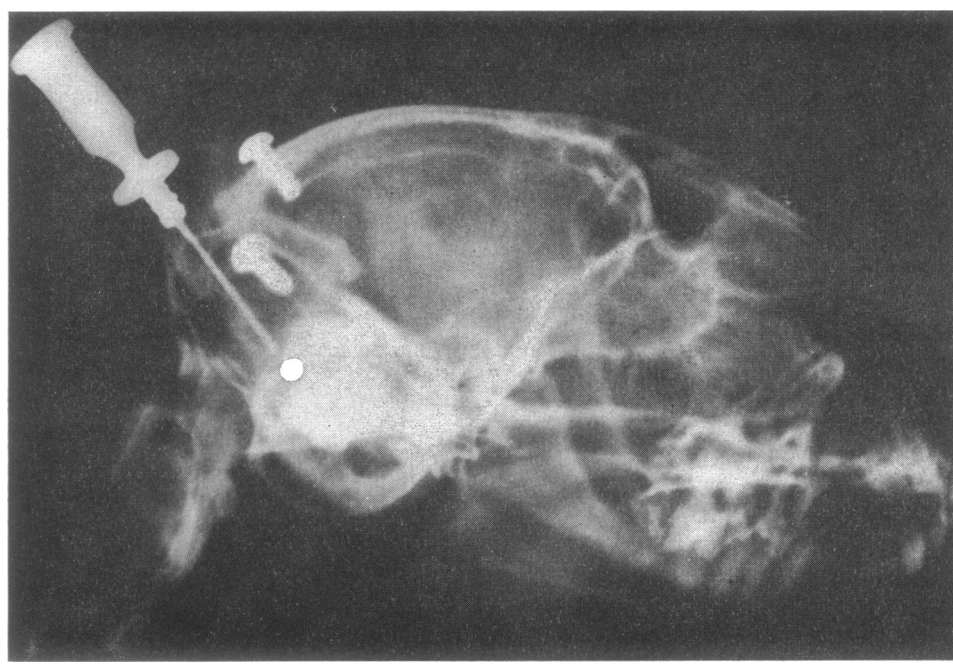

Fig. 1.

The resulting deficits can thus be attributed to the centrifugal pathway which has been affected, and the selective pharmacological approach to this problem would seem to be the method of choice.

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REFERENCES

COMIS, S. D. (1970). Centrifugal inhibitory processes affecting neurones in the cat cochlear nucleus. *J. Physiol. Lond.*, **210**, 751–760.

COMIS, S. D. & WHITFIELD, I. C. (1968). Influence of centrifugal pathways on unit activity in the cochlear nucleus. *J. Neurophysiol.*, **31**, 62–68.

RAMUSSEN, G. L. (1964). Anatomic relationships of the ascending and descending auditory systems. In: *Neurological Aspects of Auditory and Vestibular Disorders*, ed. FIELDS, W. S. & ALFORD, R. R., pp. 1–19. Springfield: Thomas.

RASMUSSEN, G. L. (1967). Efferent connections of the cochlear nucleus. In *Sensorineural Hearing Processes and Disorders*, ed. GRAHAM, A. B., pp. 61–75. Boston: Little Brown.

WHITFIELD, I. C. (1968). The pharmacological behaviour of the cochlear nucleus. In *Drugs and Sensory Functions*, ed. HERXHEIMER, A., pp. 167–174. London: Churchill.

Direct observation of the effects of nerve stimulation and of exogenous catecholamines on the rat mesenteric vasculature

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An *in vivo* preparation of the rat mesentery has been used to investigate the effects of nerve stimulation and exogenous catecholamines on small blood vessels. The exteriorized mesentery of the anaesthetized rats was viewed using transmitted light and long working distance objectives of 10 and 32 times magnification. The stage of the microscope was modified so that the mesentery and intestine lay in a warmed bath which was circulated with oxygenated, modified Krebs' solution. The area to be observed was arranged over a transparent plate set into the bath. The microscope had binocular eyepieces and was fitted with a beam splitter so that the field could be viewed and filmed simultaneously. Vessel diameters were measured using a calibrated eyepiece.

Small holes were cut in the mesentery on either side of the artery and vein supplying the area to be examined. Paravascular nerves were stimulated by a pair of parallel silver wire electrodes which were inserted through these holes, below the vessels and accompanying nerves. The electrodes were raised so that the vessels were held slightly above the level of the solution in the bath. The nerves were generally stimulated by square pulses of 0·5 ms duration at frequencies between 0·5 and 6 Hz and a strength insufficient to directly stimulate the smooth muscle of the blood vessels. To study the reactions of the vessels to catecholamines the level of solution in the bath was lowered and the catecholamine, dissolved in 0·1 ml of carrier solution, was applied from a syringe. The bath was flushed with fresh solution and the vessels allowed to recover between applications of catecholamine. The actions of antagonists of the nerve-mediated response and of directly applied catecholamines were examined by replacing the solution in the bath by one containing the blocking agent.

Arteries from 10 to 350 μ, capillaries from 3–7 μ and veins from 10–560 μ in diameter have been examined. Nerve stimulation constricted arteries above 20 μ and veins above 30 μ in diameter, but there was no constriction of smaller arteries