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Centrally mediated contraction of the lower eyelid elicited by anticholinesterases in anaesthetized rats

In anaesthetized rats, centrally acting anticholinesterases elicit a rise in blood pressure (Dirnhuber & Cullumbine, 1955; Varagić, 1955) and augmentation of the cervical sympathetic outflow (Kuga & Erdmann, 1967; Nakagawa, 1968; Stemanović & Varagić, 1970). We have found that the rat lower eyelid, as a sympathetic effector organ (Gertner, 1956; Spriggs, 1966; Morpurgo, 1968), offers an easy approach to indicate central sympathetic hyperactivity. Recording the movements of the rat lower eyelid may provide reliable information about the central excitatory action of anticholinesterases.

Male white rats, 270 to 370 g, anaesthetized with urethane (1·3–1·5 g/kg, s.c.), immobilized by gallamine and artificially ventilated, were used. Before each experiment, bilateral adrenalectomy was performed. Blood pressure was measured in

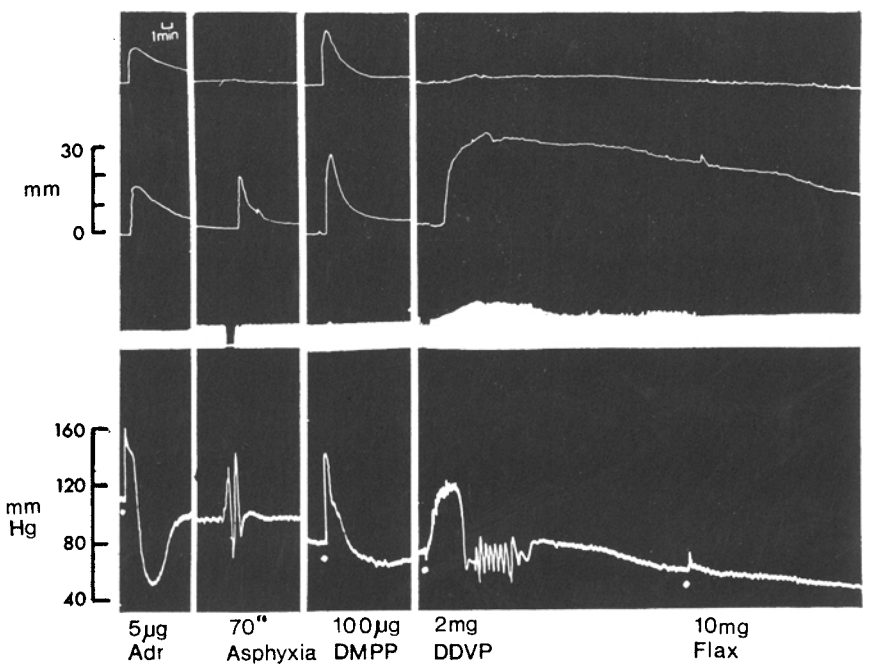

FIG. 1. Reactions of an anaesthetized rat (290 g) upon adrenaline hydrochloride, asphyxia, dimethylphenylpiperazinium iodide, and dichlorvos. Traces from top to bottom: decentralized lower eyelid, innervated lower eyelid, intratracheal pressure, femoral blood pressure. Doses were given per kg body weight intravenously. Asphyxia was elicited by stopping the artificial ventilation for 70 s.

the femoral artery via a mercury manometer. Change in intratracheal pressure was monitored by means of a piston recorder attached to the tracheal cannula. Movements of the left and right lower eyelids were simultaneously recorded with light isotonic levers. The cervical vago-sympathetic trunk was dissected and cut on one of the sides. Drugs were given into the cannulated femoral vein.

The anticholinesterase insecticide dichlorvos (DDVP; dichlorovinyl dimethyl phosphate) 2-4 mg/kg) evoked a sustained contraction on the innervated but not on the decentralized lower eyelid (Fig. 1). Mevinphos [(carbomethoxylpropen-2-yl)-dimethyl phosphate], another organophosphorus insecticide, exerted a similar effect in a dose of 200 to 400 μg/kg. Contractions after the administration of physostigmine salicylate, 200 to 400 μg/kg, were much less pronounced, although the blood pressure rise was marked.

It is obvious that this type of action, requiring intact cervical preganglionic sympathetic nerve, is of central origin. The anticholinesterases used did not affect the decentralized lower eyelid, while drugs acting peripherally proved to be effective on both the sides (Fig. 1). The increase of intratracheal pressure seen in Fig. 1 was absent in several cases. This reaction had no causal connection with the evoked eyelid contractions because blocking the development of bronchoconstriction by a quarternary tropine derivative did not prevent the anticholinesterase-induced contraction of the innervated lower eyelid. Thus, the centrally mediated sympathetic reaction elicited by the anticholinesterases cannot be attributed to consecutive hypoxia due to cholinergic bronchoconstriction. This agrees with the conclusion of Varagić & Beleslin (1962) concerning the hypertensive effect of physostigmine.

The method presented here does not require special laboratory equipment and has the advantage that the decentralized lower eyelid can also serve as control.

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A modified silver clip used in the induction of renal hypertension in the rat

Renal hypertension induced by renal artery stenosis plus nephrectomy of the contralateral kidney in the rat is a well characterized model of experimental hypertension. The method most commonly used is to separate the renal artery and to compress it by means of a U-shaped clip of annealed silver ribbon (Wilson & Byrom, 1939) using a compressing device similar to that described by Schaffenberg (1959). This device allows a pre-set value to be given to the internal lumen of the clip, thus controlling the degree of compression of the artery.