

Contractile effects of some local anaesthetics on the rat stomach strip

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Local anaesthetics have been shown to produce a number of effects on smooth muscles ranging from antagonism of agonist action to direct stimulant effects. For example, a non-specific depressant effect on the rabbit aortic strips (Astrom 1964) and perfused rabbit ear preparation (Fleckenstein 1952) have been reported. In other studies, it was observed that xylocaine potentiated while procaine antagonized the effects of adrenaline on the rabbit aortic strip (Nava-Rivera et al 1967). Similarly, procaine has been shown to potentiate the responses of the rat stomach strip to prostaglandin E₂ (Coceani & Wolfe 1966). During preliminary investigations, it was observed that procaine contracted the rat stomach strip preparation. The present experiments were designed to study this contractile effect of procaine and some other local anaesthetics.

Adult rats (120 g–180 g) of either sex were killed by a blow on the head and exsanguinated. The fundic part of the stomach was removed, cut into a longitudinal strip and set up according to Vane (1957). The preparation was superfused with aerated Tyrode solution (at 37 °C) by means of a Watson-Marlow flow inducer (MHRE 22) at a flow rate of 6 ml min⁻¹. The initial tension on the tissue was 1.0 g. All contractions (magnification × 6) were recorded on a smoked paper through an auxotonic lever (Paton 1957).

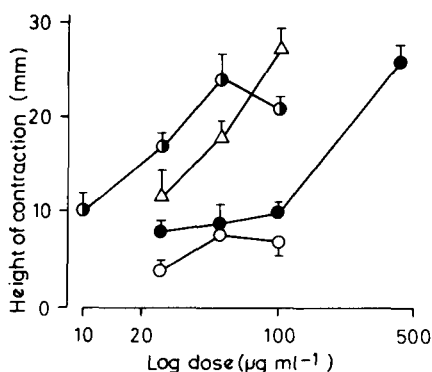


FIG. 1. Contractile effect of butacaine (●); lignocaine (△); procaine (●) and amethocaine (○) on the superfused rat stomach strip preparation. Each point represents the mean ± s.e. of six experiments.

Different concentrations of the local anaesthetics were successively superfused over the strip for 60 s as soon as possible after relaxation of the tissue to the base line. The strips did not develop spontaneous activity on exposure to any of the local anaesthetic agents used nor was tachyphylaxis observed during repeated applications. Butacaine (10–100 µg ml⁻¹), lignocaine (25–100 µg ml⁻¹), amethocaine (25–100 µg ml⁻¹) and procaine (50–400 µg ml⁻¹) produced concentration-dependent contractions of the superfused rat stomach strip (Fig. 1). The contractile responses to all agents were similar except that lignocaine-induced contractions were slower in onset and in some preparations, butacaine induced more persistent contractions. The rank order of potency (based on the response to the same dose of the local anaesthetics) was butacaine > lignocaine > procaine > amethocaine which is similar to their local anaesthetic potencies except that amethocaine was out of place.

Amethocaine (100 µg ml⁻¹ and above) produced a biphasic response usually consisting of a contraction followed by a relaxation. The contractile responses to submaximal concentrations of the local anaesthetics were not reduced by atropine (2 × 10⁻⁷ g ml⁻¹) and methysergide (2 × 10⁻⁶ g ml⁻¹) at doses which completely abolished the responses of the stomach strip to acetylcholine (1 × 10⁻⁷ g ml⁻¹) and 5-hydroxytryptamine (1 × 10⁻⁷ g ml⁻¹) respectively. These results suggest that the contractile action was not mediated through cholinergic or 5-hydroxytryptaminergic receptors. Histamine and adrenoceptor antagonists were not tested because histamine response is tachyphylactic while catecholamines cause a relaxation in this preparation.

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