

Myocardial Opiate Receptors

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Abstract. The effect of morphine and met-enkephaline on the isometric contraction of rabbit papillary muscles was studied. The tested compounds produced a dose-dependent, stereospecific and naloxon-reversible negative inotropic effect indicating the existence of opiate receptors in cardiac muscle. A pretreatment of papillary muscles with the β -blocking agent atenolol attenuated the negative inotropic action of morphine and met-enkephaline suggesting a presynaptic localization of cardiac opiate receptors.

Key words: Opiate receptor — Cardiac muscle — Contraction — Opiate and opioid peptide — Naloxone — Dextrorphan

Introduction

The opiate receptors and their endogenous ligands, enkephalins and β -endorphin, have already been identified in the central and peripheral nervous systems of many animal species (Kosterlitz and Hughes 1978; Kosterlitz 1980). The presence of one of these opioid peptides, met-enkephaline, has been also detected in mammalian myocardial tissue (Hughes et al. 1977). However, specific opiate receptors have not yet been identified in the previous studies of the effect of morphine on different cardiac preparations. (Carnie et al. 1961; Kennedy and West 1967; Kosterlitz and Taylor 1959; Montel and Starke 1973; Hughes et al. 1977; De Silva et al. 1978). In the present work the question concerning myocardial opiate receptors has been approached by studying the inotropic effects of morphine and met-enkephaline on a more simple bioassay system — rabbit papillary muscle.

Methods

Adult New Zealand rabbits of both sexes weighing 2.0 to 3.0 kg were used for the experiments. Papillary muscles, 0.7—1.0 mm in diameter, were rapidly excised from the right ventricle and placed into a bath designed by the "chamber method" of stimulation (Kamiyama and Matsuda 1966; Saxon et al. 1981). Tyrode solution of the following composition was used (in mmol/l): Na^+ 150.8, K^+ 4.0, Cl^- 148.4, Ca^{2+} 2.7, Mg 1.0, HCO_3^- 12, H_2PO_4^- 1.8, glucose 10; pH 7.4; $t = 36 \pm 1^\circ\text{C}$. This solution was gassed with 4% CO_2 + 96% O_2 . The preparation was stimulated by 3 ms 2.0-threshold square pulses