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Electrophysiological effects of bunaphtine on guinea pig myocardium

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Bunaphtine (N-(2-Diethylaminoethyl)-N-(n-butyl)-α-naphthamide has been found effective in the treatment of both ventricular and supraventricular arrhythmias, either chronic or paroxysmal (Vegis, 1975). On the basis of its cardiac electrophysiological effects on guinea-pig and rabbit heart bunaphtine (BNA) has been considered as a membrane stabilizer (Ferroni & Monticelli, 1973). However, recent experiments on human atria using bipolar suction electrodes considered the BNA as a class 3 antiarrhythmic drug (Fenici, Marchei, Bellocci & Zecchi, 1977) according to the classification of Vaughan Williams (1970). The present study has been devoted to determining which of these actions is exhibited by bunaphtine.

Right ventricular guinea-pig papillary muscles were perfused with warmed (34°C) and oxygenated Tyrode solution and stimulated at a basal rate of 1 Hz. Intracellular action potential were recorded with glass microelectrodes filled with KCl solution (3 M). Preparations were observed both under control conditions and during exposure to BNA in concentrations from 1×10^{-7} M to 1×10^{-4} M (0.36–36.5 mg/l). Spontaneous activity was induced by adding $BaCl_2$ (0.2 mM) to the normal Tyrode solution. Ca-action potentials were elicited by adding isoprenaline (0.2 mg/l) to high K (27 mM) Tyrode solution.

At concentrations between 1×10^{-7} M and 5×10^{-6} M BNA exerted no significant effect on resting membrane potential or overshoot and thus no change in total amplitude of the action potential occurred. At higher concentrations BNA produced a dose-dependent decrease on the amplitude, overshoot and maximum upstroke velocity of the action potential but no change was observed in resting membrane potential. Reduction of maximum upstroke velocity was more pronounced at lower membrane potentials and the inactivation curves were shifted to more negative membrane potentials. At all concentrations used in this study BNA prolonged the total action potential duration. This effect was due predominantly to a decreased slope of phase 3 and was accompanied by an increase in the effective refractory period of the ventricle. BNA (1×10^{-5} M—5×10^{-5} M) reduced the maximum following frequency and almost suppressed the pacemaker activity elicited by Ba ions in ventricular fibers, while it had no effect on the Ca-mediated action potentials. It is concluded that BNA is an antiarrhythmic drug of the first class and within this group is more closely related to quinidine than to lidocaine.

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