Inhibition of glybenclamide-sensitive K^+ channels underlies noradrenergic depolarization of the rat tail artery in vitro

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In rat tail artery, activation of α_2-adrenoceptors by noradrenaline released from perivascular sympathetic axons produces a slow depolarization of the smooth muscle through a decrease in K^+ conductance [1]. This study used intracellular recording to investigate whether neurally-released noradrenaline inhibits ATP-sensitive K^+ (K_{ATP}) channels in this artery. Segments of proximal tail artery were isolated from female Wistar rats (~8 week of age) anaesthetized with pentobarbital (100 mg/kg, i.p.) and exsanguinated. The tissues were mounted in a 1 ml recording chamber and intracellular recordings were made with glass microelectrodes (120 -200 MΩ). Changes in membrane conductance were monitored by measuring the time constant of decay of excitatory junction potentials. The K_{ATP} channel blocker, glybenclamide (10 μM), depolarized the smooth muscle and decreased membrane conductance. Conversely, both the K_{ATP} channel opener, pinacidil (0.1 and 0.5 μM), and calcitonin gene related peptide (10 nM; CGRP) hyperpolarized the smooth muscle and increased membrane conductance. The nerve-evoked slow depolarization was abolished by glybenclamide and was potentiated by CGRP. However, unlike CGRP, pinacidil had an inhibitory effect on the slow depolarization. These findings suggest that neurally-released noradrenaline inhibits the activity of K_{ATP} channels, resulting in membrane depolarization. We suggest the inhibitory action of activating α_2-adrenoceptors on K_{ATP} channels is due to an inhibition of protein kinase A activity mediated through a reduction in cAMP levels [2].

(1) Cassell JF, McLachlan EM, Sittiracha T. (1988) J. Physiol. 397: 31-49.
(2) Hayabuchi Y, Davies NW, Standen NB. (2001) J. Physiol. 530:193-205.