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Voltage-dependent Ion Channels in the Neuroendocrine Cells of Rat Prostate

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Neuroendocrine (NE) cells are abundant in the prostate at birth and then disappear from the peripheral zone, only to reappear during puberty, after which their number slowly increases during adult life. NE cells are believed to play an important role in prostate growth and differentiation. The present study was undertaken to investigate the characteristics of ion channels existing in NE cells of rat prostate gland. After enzymic digestion of rat ventral prostate, nystatin-perforated patch clamp technique was applied to oval shape cells with dark cytoplasm, which were identified as NE cells from their chromogranin-A immunoreactivity. Four different types voltage-dependent ionic currents were recorded. With CsCl pipette solution, voltage-dependent Ca^{2+} current was recorded, which could be blocked by nifedipine and ω-conotoxin GVIA, an L-type and N-type Ca^{2+} channel blocker, respectively. With KCl pipette solution, transient outward K^+ current (I_{to}), Ca^{2+}-activated K^+ currents (IK_{Ca}) and inwardly rectifying K^+ current (IK_{ir}) were identified. I_{to} was selectively inhibited by 4-aminopyridine (5 mM) and IK_{Ca} was blocked by charybdotoxin (50 nM), iberiotoxin (10 nM) or clotrimazol (1 μM). IK_{ir} was identified as a Ba^{2+}-sensitive current recorded under high K^+ (60 mM) bath solution, which showed strong inward rectification at around the Nernst equilibrium potential of K^+. Electrical activity of NE cells triggers the secretion of paracrine hormones and neurotransmitters. Ion channels studied above, therefore, would play important roles in the regulation of functions of prostate NE cells.