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Spontaneous electrical firing of mouse adrenal zona glomerulosa cells: role of Cav3.2 channels

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The resting membrane potential of freshly isolated aldosterone producing zona glomerulosa cells (ZG) follows closely the equilibrium potential for potassium, and is more hyperpolarized than the Vm of cells in primary culture. Across species, ZG cells lack TTX sensitive Na channels and thus at rest have been considered electrically silent. We studied mouse ZG cells retained within rosettes in adrenal slices to determine their electrical properties. In 92% of cells, spontaneous membrane potential oscillations (MPO) were recorded in whole-cell current clamp mode with a periodicity of 0.34±0.03 Hz, an amplitude of 67.6±1.1 mV and a threshold of -86 mV. These low-threshold MPOs occurred in cells expressing robust Ca currents that peaked at -40 mV with a density of 187.3±11.8 pA/pF. Ca currents were not decreased by nitrendipine (NTR, 100 nM), nor increased by BAYK8644 (100nM-1μM) but were inhibited by nickel with an EC50 of 22.5 μM. mRNA for Cav3.2 but not Cav3.1 or Cav3.3 was strongly expressed in the ZG layer of laser captured micro-dissected slices. MPOs persisted in the presence of NTR or BAYK8644, but were silenced by nickel (50 μM). MPO frequency was increased by Angiotensin II with an EC50 of 67 nM. We conclude that ZG cells retained with an adrenal slice are electrically excitable and that Cav3.2 channels contribute to pacemaker currents that control spontaneous and hormone-stimulated firing.