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Electrophysiological and Parmacological Properties of Acutely-Isolated Single Subfornical Organ Neurons

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The subfornical organ (SFO) represents neuroglial circumventricular organ structures bordering the anterior third cerebral ventricle. Owing to the absence of the blood-brain barrier, the cellular elements of subfornical organ can be reached by circulating messenger molecules transferring afferent information and provide a good coding model of chemical information processing in the body.

In this work single neurons were isolated by fire-polished glass pipettes after incubating the brain slice (500 μm) containing SFO with pronase and thermolysin. Whole cell currents were recorded by patch clamp technique.

SFO neurons showed an ovoid cell body of 6-13 μm in diameter, and one or two processes of 6-60 μm in length. Recordings in current-clamp mode revealed a mean resting membrane potential of -32.8 $\pm$ 1.64 (n=4) mV, an input resistance of 1.19 $\pm$ 0.28 GΩ and membrane time constant 1.32 $\pm$ 3.71 ms. The four types of currents in SFO neurons were characterized as a 1) rapid, transient inward current that can be blocked by tetrodotoxin (TTX) characteristic of sodium current; 2) slow-onset sustained outward current that can be blocked by tetraethylammonium (TEA) characteristic of a delayed rectifier potassium current; 3) remaining outward current that has a rapid-onset and transient characteristic of a potassium A type current; and 4) slowly activating, inward current that can be blocked by Cd^{2+} characteristic of L-type calcium current.

Angiotensin II (10^{-7} M) attenuated the peak potassium currents to 20% of control. Glutamate (100 μM) and GABA (1 μM) induced inward currents were 78$\pm$24.11 pA (n=5) and 8.03$\pm$1.08 nA (n=5), respectively.

Our results indicate that SFO neurons are distinguishable from other CNS neurons in its high input resistance and lower responses to glutamate, suggesting unique physiological roles of SFO neurons.