Corticotropin-releasing factor increases Purkinje neuron excitability by modulating sodium, potassium, and Ih currents.

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Abstract:

Corticotropin-releasing factor (CRF) is a neuromodulator closely associated with stress responses. It is synthesized and released in the central nervous system by various neurons, including neurons of the inferior olive. The targets of inferior olivary neurons, the cerebellar Purkinje neurons (PNs), are endowed with CRF receptors. CRF increases the excitability of PNs in vivo, but the biophysical mechanism is not clear. Here we examine the effect of CRF on the firing properties of PNs using acute rat cerebellar slices. CRF increased the PN firing rate, regardless of whether they were firing tonically or switching between firing and quiescent periods. Current- and voltage-clamp experiments showed that the increase in firing rate was associated with a voltage shift of the activation curve of the persistent sodium current and hyperpolarizing-activated current, as well as activation of voltage-dependent potassium current. The multiple effects on various ionic currents, which are in agreement with the possibility that activation of CRF receptors triggers several intracellular pathways, are manifested as an increase excitability of PN.

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