Electrophysiological Study on the Effects of Leptin in Rat Dorsal Motor Nucleus of the Vagus

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摘要

Abstract

Immunoreactivity of leptin receptor (Ob-R) has been detected in rat dorsal motor nucleus of the vagus (DMNV). Here, we confirmed the presence of Ob-R immunoreactivity on retrograde-labeled parasympathetic preganglionic neurons in the DMNV of neonatal rats. The present study investigated the effects of leptin on DMNV neurons, including parasympathetic preganglionic neurons, by using whole cell patch-clamp recording technique in brain stem slices of neonatal rats. Leptin (30 – 300 nM) induced membrane depolarization and hyperpolarization, respectively, in 14 and 15 out of 80 DMNV neurons tested. Both leptin-induced inward and outward currents persisted in the presence of TTX, indicating that leptin affected DNMV neurons postsynaptically. The current-voltage (I – V) curve of leptin-induced inward currents is characterized by negative slope conductance and has an average reversal potential of – 90 ± 3 mV. The reversal potential of the leptin-induced inward current was shifted to a more positive potential level in a high-potassium medium. These results indicate that a decrease in potassium conductance is likely the main ionic mechanism underlying the leptin-induced depolarization. On the other hand, the I – V curve of leptin-induced outward currents is characterized by positive slope conductance and has an average reversal potential of – 88 ± 3 mV, suggesting that an increase in potassium conductance may underlie leptin-induced hyperpolarization. Most of the leptin-responsive DMNV neurons were identified as being parasympathetic preganglionic neurons. These results suggest that the DMNV is one of the central target sites of leptin, and leptin can regulate parasympathetic outflow from the DMNV by directly acting on the parasympathetic preganglionic neurons of the DMNV