GLUTAMATE HAS A MODULATORY EFFECT ON THE REFLEX CONTROL OF RESPIRATION

A. I. Rakin[1], H. Bui Thi[1], V. G. Aleksandrov[1] and N. P. Aleksandrova[2]

[1]Herzen State Pedagogical University of Russia, 6 Kazanskaya (Plekhanova) st., 191186, Saint-Petersburg, Russia, vg_aleks@yahoo.com

[2]Pavlov Institute of Physiology RAS, 6 Makarova emb., 199034, Saint-Petersburg, Russia.

The aim of present study was to test the hypothesis that endogenous glutamate, the increased level of which is observed in hypoxia, could have a modulatory effect on the reflex control of respiration. Acute experiments on spontaneously breathing; urethane-anesthetized rats had been performed to study the effects of cerebroventricular and intracortical microinjections of glutamate on the expiratory-promoting and inspiratory-inhibitory Hering-Breuer reflexes. The expiratory-promoting reflex was evaluated from changes in time of expiration immediately after airway occlusion at the end of inspiration. The inspiratory-inhibitory reflex was estimated from changes in inspiratory time provoked by airway occlusion at the end of expiration. It had been shown that a higher level of glutamate in cerebrospinal fluid increases the power of both reflexes. The effects of the glutamate injected into the infralimbic cortex that is the accepted visceromotor area were more complicated. Glutamate caused a strengthening of both reflexes being injected to the left. Microinjection of glutamate into the right cortex produced a weakening of expiratory-promoting reflex but had no effect on inspiratory-inhibitory reflex. These results confirme our hypothesis and prove that increased cerebral level of glutamate provides modulatory effect on the reflex mechanisms of the respiratory control. Moreover, they suggest that the cerebral glutamate can have a different impact on the cortical mechanisms which localized in the right and left infralimbic cortex and capable, as it was established in previous studies, to control the respiratory reflexes.