

Effects of Propofol on Spontaneous Firing Activity of Locus Coeruleus Noradrenergic Neurons

Background: Previous studies show that propofol activates the ventrolateral preoptic nucleus (VLPO), the main sleep-active nucleus, to exert its sedative effects. However, it is still controversial on the key wake-active nucleus locus coeruleus (LC) are involved in generating the sedative state. In present study, we tested whether lesion of the VLPO neurons would affect the spontaneous firing activity of LC neurons under different concentrations of propofol.

Method: 24 Sprague Dawley rats were divided into two groups, the control group and lesion group. Rats were anesthetized with propofol $10 \text{ mg}\cdot\text{kg}^{-1}$ IV. Then pump propofol with 30 or $60 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$ respectively. Rats were divided into two groups according to the infusion rate, each group was 6 rats. For the lesion group, 0.015 ul ibotenic acid (10 nmol/l) were microinjected to bilateral VLPO before recording. Glass microelectrodes filled with 2% Pontamine Sky Blue in 0.5 mol/L sodium acetate were stereotaxically directed to the LC to record extracellular spikes.

Results: The firing rate of LC neurons of low concentration group ($30 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$) increased significantly compared to high concentration group ($60 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$) ($p < 0.05$). The firing rate of LC neurons of low concentration group ($30 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$) and high concentration group ($60 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$) had no significant difference compared to the VLPO lesion group ($p > 0.05$).

Conclusion: Propofol may suppress the spontaneous firing activity of LC noradrenergic neurons. Nevertheless, VLPO neurons are not likely involved in the inhibitory effect of propofol on LC spontaneous firing activity.