BACKGROUND: To examine the impact of different types of sleep deprivation on hippocampal-mediated learning and memory in rats.

METHODS: Forty-eight Sprague-Dawley male rats were randomly assigned to 1 of 4 equal-size groups: (1) 12 hours of sleep per day (control), (2) total sleep deprivation (TSD), (3) rapid eye movement (REM) deprivation (RD), and (4) sleep restricted to 4 hours per day (SR). All rats were subjected to swimming training in the Morris water maze (MWM). At the end of the experiments, the rats were decapitated, and hippocampus tissue was analyzed for several neurotransmitters and receptors.

RESULTS: The time spent at the target quadrant increased from 20.2 to 30.0 seconds in the control group on the third day of the experiment, whereas corresponding values increased from 20.2 to 21.8 seconds in the TSD group, 22.1 to 25.4 seconds in the RD group, and 21.2 to 32.0 seconds in the SR group (p = 0.026). On the seventh day of the experiment, the values decreased to 25.0 seconds in controls, 22.5 in the RD group, and 23.6 in the SR group (p = 0.045). The TSD group demonstrated significant decreases in glutamate and serotonin levels compared with the control group. There was a significant increase in 5-HT2a receptor expression in all intervention groups compared with the controls.

CONCLUSIONS: Our results of glutamate levels and 5-HT2a receptor expression in the hippocampus seem to be primarily involved in sleep and memory regulation (Tab. 2, Fig. 4, Ref. 59). Text in PDF www.elis.sk.

KEY WORDS: sleep disorders, learning and memory, 5-HT2A, NMDA, β7, glutamate, serotonin, acetylcholine.