EuroSciCon

JOINT EVENT
28th International Conference on
Neuroscience and Neurochemistry
&
28th Euro-Global Neurologists Meeting

June 13-14, 2019
Barcelona, Spain

Elena Zakharova et al., J Neurol Neurosci 2019, Volume 10

Patterns of dopaminergic organization of memory consolidation on spatial contextual model in Morris water maze: similarities and dissimilarities

Elena Zakharova, Mikhail Monakov and **Alexander M Dudchenko**
Institute of General Pathology and Pathophysiology, Russian Federation
Centre for Psychiatry and Narcology, Russian Federation

The actual problem of neuroscience is the neuronal organization of memory functions. Given the criticality of dopaminergic (DA) influences in hippocampus for memory consolidation [1-4], we examined its DA synaptic correlates. Intact rats were trained on the spatial contextual model in Morris water maze and taken to a neurochemical experiment 2-3 days after end of two-day training. In subfractions of synaptic membranes of light and heavy synaptosomes were isolated from cortex and hippocampus, activity of DA neurons marker tyrosine hydroxylase (TrOH) was estimated. Test results (T, latency of hidden platform reaching) and enzyme activity were compared in rat group as a whole and its subgroups of capable (lower quartile) and incapable rats (upper quartile) to learning and two middle quartiles according to their abilities to memory consolidation (2s1, first test of second day of training). In rat group as a whole, positive correlation between indicators of T-TrOH was detected at 2s1 stage in heavy fraction of hippocampus. The same, but supplemented by cortical correlations, associated with that in hippocampal, DA 2s1 organization manifested itself in middle quartiles. In lower quartile (capable rats), T-TrOH correlations were negative in heavy hippocampal fraction and both cortical fractions and interconnected. In upper quartile (incapable rats), T-TrOH correlations were absent. TrOH activity was 3 to 4 times higher in hippocampus compared to cortex and, it was the highest in capable and lowest in incapable rats in heavy fraction of hippocampus. Thus, the animals were divided by TrOH activity in synapses of heavy hippocampal fraction, weakly represented in incapable rats and redundantly in capable rats. The data show that the inverse U-shaped dependence of some cognitive processes on DA system, detected in prefrontal cortex [5], can also be observed in hippocampus and cortical-hippocampal interaction through brainstem DA projections could play a significant role in memory consolidation.

Synapses are the most dynamic and labile nerve cell structures, and they are always at center of the concepts about adaptive properties of nervous tissue. Earlier, studying the cholinergic mechanisms of cognitive and other nerve functions, we applied the original methodology of neurochemical investigations on the sub-synaptic fractions extracted from the fractions of light and heavy synaptosomes [Bogolepov et al., 1985] and experimentally justified the informativeness of such research: this methodology allowed us to distinguish the synaptic responses to some impacts of different populations of cholinergic neurons, including "small" synaptic fractions, reaction of which was masked in the combined fraction of synaptosomes [Mukhin et al., 2002; Zakharova et al., 2010, 2013, 2016, 2018a; Zakharova, Dudchenko, 2014, 2016]. The second methodical way, which also seems to us very successful, is the division of learning indicators into quartiles according to the abilities of animals [Storozheva et al., 2015; Zakharova].

zakharova-ei@yandex.ru