

Changes in the gabaergic signalling in the prefrontal cortex of mice model of post-traumatic stress disorder

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It has been suggested that the neurons of prefrontal cortex, along with the hippocampus and amygdala, can undergo morphological and molecular remodelling during the development of stress-related disorders, such as PTSD [1]. Pathological remodeling of the GABAergic inhibitory signalling during stress disorders might bring significant contribution to impairment of synaptic plasticity [2] and cognition [3]. In this work we have used an experimental model of PTSD in mice, based on a single prolonged stress protocol [4] and studied alterations in the synaptic transmission and long-term synaptic plasticity in the pyramidal neurons of prefrontal cortex. The stress state in the animals was evaluated with the aid of Open field and Elevated cross-maze behavioural tests.

We have found an increase in the quantal amplitude of GABA-ergic spontaneous inhibitory synaptic currents (mIPSCs) in the neurons of prefrontal cortex of stressed animals. There was also elevation in the frequency of mIPSC in neurons of the stress-group vs control group. These results demonstrate that exposure to stress can cause an up-regulation of the GABAergic inhibitory system in the prefrontal cortex. In the experiments on long-term potentiation (LTP) of field postsynaptic potentials (fEPSP), we have observed that the amplitude of LTP induced by the theta-burst stimulation in the prefrontal cortex synapses of stressed mice was much lower than in the control group. The data obtained suggest that stress-induced up-regulation of inhibitory signalling can affect long-term synaptic plasticity in the prefrontal cortex and thereby contribute to cognitive impairment.

Biography

Arina Serbina is a 5th year graduate student, School of Life Sciences, Immanuel Kant Baltic Federal University, specialty bioengineering and bioinformatics; Alexander Bogdanov is a researcher at School of Life Sciences, Immanuel Kant Baltic Federal University (Russia, Kaliningrad). Dr. Yuriy Pankratov - PhD, Associate professor at School of Life Sciences at the University of Warwick, UK.