

Impact of Psycho-Emotional Stress on Activity of Brain Antioxidant System and Energy Metabolism in Naturally Aggressive (Killer) Animals

Nana Koshoridze, Zurab Kuchukashvili, Giorgi Burjanadze, Natalia Dachanidze, Ketevan Menabde, Matrona Chachua

We studied functional status of hippocampal antioxidant system and specifics of metabolism in laboratory rats under prolonged isolation and disrupted circadian rhythm. Aggressiveness of animals was shown by mouse killing method and proved by physiological and biochemical parameters.

It was seen that naturally aggressive (killer) and non-aggressive rats do not show any difference with regard to the functional state of hippocampal antioxidant system cells. This conclusion was derived based on activity of antioxidant system enzymes, such as superoxide dismutase, catalase, glutathione reductase and glutathione peroxidase. It was established activity of the enzymes under study remains equal in aggressive and non-aggressive individuals. No difference was found in lipid superoxidation process either: products of both processes were presented in equal amounts in hippocampal cells in both groups.

Similar unreliable changes were also found in case of activity of the enzymes involved in energy metabolism, such as succinate dehydrogenase, aconitase, fumarase, creatine kinase. This must indicate oxidizing phosphorylation and ATP synthesis is conducted at the same rate in both groups.

Results outlined a different picture when judged based on prolonged psycho-emotional stress. It was seen that the psycho-emotional stress caused by prolonged isolation and disrupted circadian rhythm does not uniformly affect the hippocampal antioxidant system of naturally aggressive (killer) and non-aggressive rats. It was established that when under stress, change of biochemical parameters, such as enzyme activity and lipid superoxidation, is much more drastic in aggressive animals.

The results may suggest that biochemical processes in hippocampal cells are conducted at a similar rate in both aggressive and non-aggressive animals. However, aggressive individuals, when subjected to psycho-emotional stress, show a higher sensitivity to the changes. The results indicate that the hippocampus may not be the section of the brain involved in expression of natural aggressiveness.