

Changes in Activity of Enzymes Related to Energy Metabolism in Rat Brain and Functional State of Mitochondria under Psycho-Emotional Stress

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Stress is known as the destructive cause of metabolism in the cells, usually resulting in the formation of pathologic processes. Reasons of such processes include, among others, changes in energy metabolism. We have studied specific features of energy metabolism in rat brain under prolonged psycho-emotional stress. We have found that when subjected to the given conditions brain mitochondria display a reduced level of Creatine Kinase activity. Having studied the kinetic parameters (V_{max} , K_m) of the enzyme we have suggested that the reason of such reduction must be both structural changes in the Creatine Kinase molecules, and quantitative decline of its substrates – ATP and creatine.

We have also studied the changes in the activity of other enzymes related to energy metabolism, such as Succinate Dehydrogenase, Aconitase, Fumarase and Hexokinase, under prolonged stress. It has been discovered that similar to that of Creatine Kinase, their activity also decreases, which may be indicative of a decline in the energy efficiency of the brain.

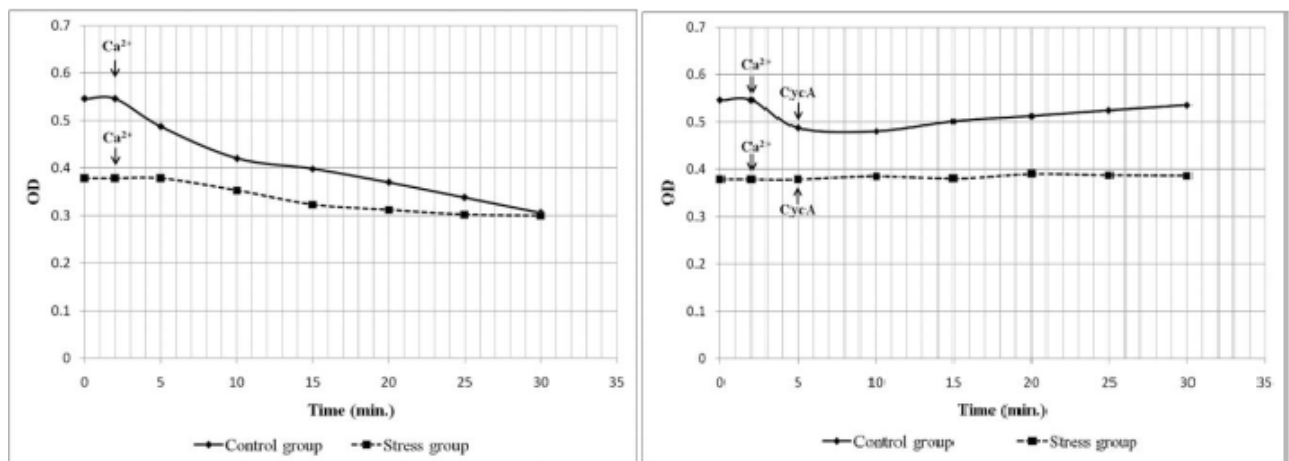


Fig.1. Ca²⁺-induced opening of MPTP in brain cell mitochondria under the conditions of isolation and disruption of circadian rhythms

Based on the data obtained, we have studied the status of the brain mitochondria penetration transitional pore (MPTP) that is known to be related to the activity of Creatine Kinase (Fig.1). It has been established that stress induced opening of the MPTP, which may serve as a stimulant of apoptotic processes in brain cells.