

## **Abstract**

On samples of the mitochondria and synaptic membranes isolated from rat brains using differential centrifugation, we tried to evaluate the neuroprotective efficacy of a combination of mitochondriaspecific antioxidants, acetyl-L-carnitine (ALC) and  $\alpha$ -lipoic acid (LA), with nicotinamide (NAm), against diabetes-induced disorders in the CNS. Three groups of adult male Wistar rats were examined; these were control intact rats (group C), animals with experimental streptozotocin (STZ)-induced diabetes (group D; 6 weeks after STZ injections), and diabetic rats treated during the two final weeks of the above period by a combination of ALC, LA, and NAm (separate daily injections; doses 100, 50, and 100 mg/kg body mass, respectively; group D+T). At the day of preparation of the organelle samples, the mean blood glucose levels in groups C, D, and D+T were 4.8, 20.3, and 15.4 mM, respectively. The intensity of reactive oxygen species (ROS) production in the brain mitochondria from rats of group D measured by fluorescent analyses using 2',7'-dichlorofluorescein diacetate was, on average, 37.2% greater than that in group C. Co-treatment provided a significant decrease in the above index in group D+T (27.8% in comparison with group D). Diabetes led to dramatic intensification of the CYP2E1 protein level in the liver of group D animals (242% vs. group C). In group D+T, this index was 33.1% lower than that in group D.

**Keywords:** diabetes, oxidative stress, acetyl-L-carnitine, alpha-lipoic acid, nicotinamide, CYP2E1, mitochondria, membrane potential, synaptic membranes, ATP, NAD<sup>+</sup>