The Role of L-Arginine in the Functioning of the Antioxidant System in Depressed Rats

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The study investigated the influence of dietary L-arginine on depression-like states induced by corticosterone administration in male laboratory rats, focusing on select physiological parameters and the antioxidant system. It was demonstrated that daily administration of L-arginine at a dose of 150 mg/kg for 14 days significantly alleviated corticosterone-induced depressive symptoms. Notably, improvements were observed in cognitive functions impaired by depression, alongside increased serotonin levels in the prefrontal cortex and hippocampal neurons of the brain.

Behavioral changes were also evident in the forced swim test, where L-arginine administration led to a marked improvement in depression-related behaviors. To elucidate the mechanism underlying the potential antidepressant effect of dietary L-arginine in the brain, quantitative changes in nitric oxide (NO) and lipid peroxidation products, particularly malondialdehyde (MDA), were assessed. Depression-induced elevations in these compounds were significantly reduced following L-arginine treatment.

Concomitant with the reduction in lipid peroxidation products and NO levels, an increase was observed in the activity of antioxidant enzymes such as mitochondrial superoxide dismutase (SOD) and catalase, which are typically downregulated in the brains of depressed rats.

The study of the kinetic parameters (Vmax and Km) of the respective enzymes demonstrated that L-arginine enhances both the maximal velocity and the substrate affinity of these enzymes. Consequently, under conditions of corticosterone-induced depression, the activating effect of L-arginine on the activity of antioxidant system enzymes appears to be mediated not only by structural modifications of the enzymes but also by an upregulation of their synthesis.