

## **Abstract**

Depression (*major depressive disorder*; MDD) is a common and chronic psychiatric disorder. MDD causes a significant reduction in the quality of life, reduces the ability to work, and thus causes a burden on disabled patients, healthcare, and all of society. The pathophysiological features of depression are often ambiguous, and therefore current treatment for depression is insufficient. Chronic stress plays an important role in the pathogenesis of depression. It causes dysregulation of the hypothalamic-pituitary-adrenal axis (HPA axis) controlling cortisol release, imbalance of neurotransmitters and neuromodulators, and imbalance between pro-inflammatory and anti-inflammatory cytokines. Another neurobiological sign of depression is a disruption of energy metabolism in the brain, for which mitochondria are responsible. In addition to ATP, mitochondria also form reactive oxygen species (ROS). ROS are in excessive amounts during chronic stress and disrupt cellular energy. Therefore, substances related to mitochondrial energy and antioxidant effects are currently being investigated. Ketamine, dizocilpine and phencyclidine are particularly effective in mitochondrial metabolism. However, the clinical use of these substances is complicated by their hallucinogenic and neurotoxic effects. Antioxidants help restore mitochondrial function and thus demonstrate antidepressant effects. Therefore, a method involving the keeping of cellular energy and antioxidant effects could prove effective in the treatment of depression.

**Keywords:** depression, mitochondria, ROS, cortisol, MDD, stress