

Differential Effects of Chronic Magnesium Supplementation (Citrate, Glycinate, and Malate) on Brain Function, Behavior, and Muscle Strength in Rats

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Magnesium (Mg) balance is important for the vitality and functionality of cells. The aim of the study is to investigate the effects of chronic Mg use on Mg levels in the brain, skeletal muscle, besides muscle strength, emotional and cognitive functions. Sprague Dawley female rats were divided into 4 groups (Mg citrate(n=10), Mg glycinate(n=10), Mg malate(n=10), control group(n=8)). Mg was given by oral gavage for 8 weeks (35.4 mg/kg/daily elemental Mg). Learning-memory (Morris water maze test-MWMT), anxiety (open field test- OFT), motor coordination (rotarod test) and muscle strength (forelimb grip strength test) were measured. BDNF and Mg levels of the whole brain, as well as the amygdala, striatum, prefrontal cortex, hippocampus regions; and Mg levels of the gastrocnemius and soleus muscles were examined. In the MWMT, latency to find the platform in the citrate group was less than the control group, and the time spent in the target quadrant was longer. Mg levels of the amygdala and BDNF levels of the hippocampus were higher in the citrate group compared to the control group. Mg citrate had a positive effect on learning and memory by improving cognitive functions. In the OFT, the glycinate group spent more time in the center of the area than the control group, and all Mg groups showed less thigmotaxis. Corticosterone levels were lower in the citrate and malate groups compared to the control. In this study, the anxiolytic activity of Mg compounds was supported. In the evaluation of skeletal muscle strength, Mg malate increased grip strength, while Mg citrate and glycinate decreased compared to control. Mg levels in muscle tissues were higher in the malate group than the control, and lower in the glycinate group. Locomotor activity was increased in the OFT in the malate group. In conclusion, it is thought that Mg malate may be beneficial, as an increase in muscle strength and performance was observed due to the high muscle Mg levels in the Mg malate group.