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Neuroendocrinological and ultrastructural observations in young adult serotonin-free male rats

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In rat skeletal musculature, it has been shown that, among catecholamines, serotonin regulates proteins, aminoacids, glycogen and cyclic nucleotides metabolism. To a better understanding of the role of tryptophan (L-Tp) and its amine, serotonin (5-HT), it has been proposed an animal model consisting of young male L-Tp–deprived rats, namely rats fed with a diet containing all of essential aminoacids excluded L-Tp, during sixty days. During experimental period, both control and L-Tp-free rats have been sacrificed with intervals of ten days, in order to investigate changes on the neuroendocrine system and skeletal musculature. In L-Tp-free rats, from 3° to 5° day of L-Tp-free feeding, paradoxically, hematic 5-HT and its metabolite 3-5-hydroxyndolacetic acid (5-HIAA) showed a significant ($P>0.05$) rise, followed by a rapid drop until the fiftieth day. Therefore, L-Tp-free rats are also 5-HT-free rats. As compared with the controls, 5-HT-free animals didn't show a body weight gain, rather they showed a decrease in body weight from the fiftieth to the sixtieth day of experiment. The skeletal musculature showed marked signs of hypotrophy or evident atrophy, in fact, at ultrastructural level, muscle fibers showed striking signs of cellular damage and degeneration. When compared with the controls, in L-Tp-free fed rats plasma levels of GH, TSH, T_3 and T_4 collapsed after 20 days after the beginning of L-Tp-deprivation. Plasma values of testosterone markedly dropped almost to the lowest range of assay sensitivity, after thirty days from L-Tp-free-feeding. These data indicate that skeletal muscles of L-Tp-free fed rats are markedly damaged not only in relation to an impaired protein synthesis, but also to an involvement of the central and peripheral neuroendocrine system.

Key word

Tryptophan, serotonin, skeletal muscles, neuromuscular transmitters, muscle protein synthesis