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OLEAMIDE PROMOTES SKELETAL MUSCLE HYPERTROPHY AND MYOBLAST DIFFERENTIATION

Yasuyuki Kobayashi[1], Tomoya Kitakaze[2], Keiichiro Sugimoto[3], Naoki Harada[1] and Ryoichi Yamaji[1]

[1]Osaka Prefecture University, Japan
[2]Kobe University, Japan
[3]Nagaoka Co., Ltd, Japan

Skeletal muscle plays important roles not only in physical activities such as locomotion but also in physiological actions such as glucose and lipid metabolism. Enhanced protein synthesis pathway in skeletal muscle leads to the maintenance and increase of the skeletal muscle mass, contributing to the improvement of quality of life. Primary fatty acid amides are important signaling molecules in mammalian nervous system, regulating sleep and locomotion. However, the effect of primary fatty acid amides on skeletal muscle remains unclear. Oleamide is one of the best-studied primary fatty acid amides. In this study, we assessed the effects of oleamide on differentiation and hypertrophy of murine skeletal muscle C2C12 cells. When C2C12 myoblasts were cultured in differentiation medium in the presence of oleamide, the levels of myosin heavy chain expression and the fusion index were increased, indicating that oleamide promoted myoblast differentiation. To examine whether oleamide stimulates skeletal muscle hypertrophy, C2C12 myotubes were cultured in differentiation medium in the presence of oleamide. Oleamide promoted protein synthesis in myotubes and increased the myotube diameters, indicating that oleamide promoted myotube hypertrophy. Furthermore, the effect of oleamide on the mTOR pathway, a major protein synthesis pathway in skeletal muscle, was determined. Oleamide increased the phosphorylation levels of mTOR and its downstream p70S6K. Next, the effect of oleamide on skeletal muscle was evaluated in mice housed in small-sized cages (1/6 size of normal cage). We previously identified that the restricted activity by housing in small-sized caged resulted in declines in the tibialis anterior muscle mass and the forelimb grip strength. Dietary oleamide suppressed the restricted activity-induced decreases in tibialis anterior muscle mass and grip strength. These results indicate that oleamide promotes skeletal muscle differentiation and hypertrophy and suppresses the decreases in muscle mass and muscle quality (grip strength) induced by the restricted activity.

Biography

Kobayashi Y is in the second year of a Master's degree in Applied Life Sciences in Osaka Prefecture University in Japan. After completing Master's degree, he plans to go on to a Doctoral course. He is majoring in Nutrition Biochemistry and has published one paper as a coauthor. He is interested in research on physiological action and molecular mechanism by which functional food component affect skeletal muscle health.

sxc02024@edu.osakafu-u.ac.jp