日本香粧品学会誌　Vol. 33, No. 4, pp. 300–304 (2009)

〈シンポジウム II〉

『おとこ力を考える』

筋運動が引き起こす内分泌・代謝反応

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Muscular Exercise-Induced Activation of Endocrine and Metabolic Systems

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Abstract

Aging-related decline in endocrine activity has been considered as one of the causes of not only senescence but also life-style diseases such as metabolic syndrome. In particular, growth hormone (GH) and catecholamine play crucial roles in lipid metabolism, so that stimulating the secretion of these hormones may be important as a countermeasure against both aging and obesity. We have shown that a low-intensity resistance exercise combined with moderate restriction of venous blood flow from muscle ("Kaatsu" exercise training) provokes marked, transient increases in blood concentrations of GH and catecholamine. The increase in blood GH also occurred even when the restriction of blood flow was applied immediately after the normal resistance exercise. In addition, direct electric stimulation of muscle caused an increase in blood GH, only when it was combined with the restriction of blood flow. The results of these experiments suggest that changes in local environment within the muscle, *i.e.*, lowered oxygenation level and accumulation of metabolic sub-products such as lactate and proton, stimulate the hypothalamic-pituitary axis through a chemoreception, and exercise intensity *per se* is not a primary factor. Without external compression by cuff ("Kaatsu"), the muscular contraction induces the reduction of muscular blood flow through an increase in internal pressure, when the contractile force exceeds ～30% of its maximal level. Based on this phenomenon, we developed a novel exercise method, low-intensity resistance exercise with slow movement and tonic force generation (LST). The LST exercise successfully caused marked increases in blood GH, catecholamine and testosterone. This method may be useful as exercise training for elderly and/or physically weak subjects.

Key words: growth hormone, catecholamine, resistance exercise, restriction of blood flow, metabolite-mediated reflex.