

褐色脂肪組織と運動習慣との関係および 褐色脂肪組織増加のための栄養介入

立命館大学 浜岡 隆文
(共同研究者) 同 黒澤 裕子
同 本間 俊行
同 二連木 晋輔
北海道大学 斉藤 昌之

Effect of Habitual Exercise and Nutritional Intervention on Brown Adipose Tissue

by

Takafumi Hamaoka, Yuko Kurosawa,
Toshiyuki Homma, Shinsuke Nirengi
Ritsumeikan University
Masayuki Saito
Hokkaido University

ABSTRACT

[Background] Brown adipose tissue (BAT) is a type of fat that serves as a site of non-shivering thermogenesis during cold exposure. It has been reported that higher BAT activity is related to lower whole body adiposity and accelerated glucose metabolism. Thus, BAT attracts much attention as a countermeasure to obesity and obesity-induced metabolic diseases. Muscle contractions modulates muscular environment and increases circulating myokines such as irisin and meteorin-like substance, resulting in the increase in BAT activity or browning of white adipose tissue. It is also reported that some kinds of functional food supplement increase cold-induced

thermogenesis (CIT) through upregulating uncoupling protein 1 (UCP1) in BAT deposits. [Purpose] The purpose of this study was to elucidate whether habitual exercise training was associated with increased BAT content and whether supplementation of grains of paradise (GP), a West African spice in the ginger family, increased BAT content and CIT. [Methods] We measured BAT parameters (tissue total-hemoglobin) at the supraclavicular region using near-infrared time-resolved spectroscopy in 7 collegiate healthy non-athletic individuals, 8 swimmers, and 8 triathletes. BAT content was higher in swimmers and triathletes than in healthy non-athletic individuals. The effects of GP intake (40mg/day for 4 weeks) were examined in a double-blind placebo-controlled design in 18 healthy individuals. We did not find any significant effects of GP intake on any parameters. However, individuals with the lower BAT content and blunted CIT response pre-intervention showed a greater increase in BAT content and CIT post-intervention. The results of this study indicate that habitual exercise training and adequate functional food intake, specifically for individuals with the lower BAT content and blunted CIT response, could increase BAT content and enhance thermogenesis, presumably reducing risk factors for developing life-style related diseases.

要 旨

褐色脂肪組織は、肥満および生活習慣病の予防に役立つとされている。そこで、継続的な運動習慣を有する者は褐色脂肪組織が多いか否か、脂肪燃焼作用のあるグレイノブパラダイス (GP) 投与が、褐色脂肪組織および寒冷時熱産生を増加させるか否かを評価することを目的とした。一般大学生、水泳選手およびトライアスロン選手において、鎖骨上窩における褐色脂肪組織量を近赤外時間分解分光装置を用いて測定した。その結果、継続的な運動習慣を有する者は、褐色脂肪組織量が多かった。一般大学生 18 名 (GP 群 9 名、プラセボ群 9 名) を対象として、ダブルブラインド法を用いて GP を 1 日 40mg、4 週間投与した結果、全体では褐色脂肪量に変化はなかった。しかし、介入前に褐色脂肪組織量が低く熱産生の低い者は、GP 摂取により褐色脂肪組織が増加した。以上から、継続的な運動習慣や適切な栄養機能性食

品の摂取が、褐色脂肪組織および熱産生を増加させることが示唆された。