PREVENTION OF IMMOBILIZATION-INDUCED MUSCLE DYSFUNCTION USING LOW VOLUME EXERCISE TRAINING AND BRANCHED CHAIN AMINO ACIDS INTAKE

Yamaguchi Kuniko1, Hamaoka Takafumi2, Shiroishi Kiyoshi3, Takuya Osada1, Murase Norio3, Kime Ryotaro3, Kurosawa Yoko5, Ichimura Shiro5, Homma Toshiyuki6, Ueda Chiho4, Mori Mika3, Esaki Kazuki3, Ohmori Fumiko2, Ohkubo Masakih, Katsumura Toshihito3
(yamanashi Gakuin Junio Coll1, National Institute of Fitness and Sports in Kanoya2, Tokyo Medical University3, Cinciati University4, Tokyo University of Sciece5, Japan Institute of Sports Science6, Tokyo Therapeutic Institute7, Japan)

Purpose: In our previous research the training program (strength and endurance training, twice a week) was effective in preventing immobilization-induced declines in muscle oxidative function and endurance. In this experiment we examined whether combination of low volume training program (strength and endurance training, once a week) and nutritional intervention could effectively prevent muscle dysfunction. The purpose of this study was 1) to examine the acute effects of branched chain amino acids (BCAA) intake on muscle endurance and oxidation capacity and 2) to examine the chronic effect of low volume exercise training and BCAA intake on immobilization-induced decrease in muscle structure and functions.

Methods: Eight subjects were recruited for the experiment after having been approved by the institutional ethical committee and obtained an informed consent to participate in the experiment. The subjects were designated into BCAA (100 mg/kg/day, daily) and placebo (iso-caloric glucose, daily) intake groups in a double blind manner. Both groups performed intermittent isometric (2sec on/2 sec off) strength [70% of maximum voluntary contraction (MVC), 10 times] and endurance (30%MVC, 1 contraction every seconds until exhaustion) grip exercise training once a week during 3 week forearm immobilization. BCAA or placebo was taken 30 minutes before the start of the measurements or the training. We measured blood BCAA concentration, forearm circumference, MVC, muscle endurance, and oxidative capacity, which was determined by time constant for recovery of muscle oxygen consumption, before and after the immobilization.

Results: Muscle endurance significantly increased in BCAA group after acute BCAA intake (from 52±7 to 57±9 sec, mean±SD, p<0.05). Blood BCAA concentration was significantly elevated by 2.0 folds 1 hour after pre-immobilization BCAA intake and 2.4 folds after post-immobilization intake in BCAA group. MVC significantly decreased both BCAA and placebo groups (BCAA, from 40.1±3.2 to 36.9±4.4 kg, p<0.05 ;PL, from 46.1±2.3 to 40.9±2.5 kg, p<0.05). Circumference did not change both groups. Muscle endurance did not change both groups, but oxidative capacity tended to decrease (p=0.09) only in placebo group.

Conclusion: Acute BCAA intake increases muscle endurance. Chronic BCAA intake did not influence muscle strength and endurance, but might maintain muscle oxidative capacity during 3 week forearm immobilization treated with a low volume strength and endurance training.

Keywords: Training, Oxidative Capacity, Amino acid