2169 EFFECT OF MEAL TIMING IN RELATION TO RESISTANCE EXERCISE ON BODY COMPOSITION IN RATS. M. Suzuki, S. Li, T. Doi, K. Okamura, and S. Shimizu, Univ. of Tsukuba, Ibaraki 305 and Saga Res. Inst. Otsuka Pharmaceutical, Saga 842-01, Japan.

To study the effect of meal timing after exercise on body composition, 20 male rats were assigned to either a group fed a meal right after exercise (R) or a group fed a meal 4 h after exercise (L). Resistance exercise (squatting) which consisted of lifting weights at 70% of each rat's one repetition maximum was conducted once a day six times from 7:00 to 7:00. The results were consumed from 7:00 to 8:00 and from 19:00 to 20:00 for R and from 11:00 to 12:00 and from 19:00 to 20:00 for L. The room was lighted from 7:00 to 19:00. The exercise regimen (10 repetitions × 15 sets) was conducted 3 days/week for 10 weeks. The body weight at the end of the study was comparable (R: 484 ± 5 g and L: 477 ± 8 g). The muscle weight (the sum of soleus, gastrocnemius, plantaris, tibia, ilius, extensor digitorum longus, quadriceps and tibialis anterior) and the bristle (muscles) was higher in R than in L (18.2 ± 0.3 vs. 17.2 ± 0.3 g, P < 0.05), while the adipose tissue weight (the sum of the perirenal, epididymal, and mesenteric fat pads) was lower in R than in L (2.1 ± 1.3 vs. 27.7 ± 2.7 g, P<0.01). These results thus suggest that a meal right after resistance exercise may contribute to both an increase in the muscle mass and a decrease in the adipose tissue than a meal consumed 4 h after exercise.


To study the effect of amino acid and glucose infusion before and during exercise on protein metabolism in both skeletal muscle and visceral tissue, ten mongrel dogs were subjected to a treadmill run (150 min, 10 km/h, 12% incline) while being intravenously infused with amino acids and glucose (AG), amino acids alone (A), glucose alone (G), or saline alone (S). The infusion was started 60 min before the exercise regimen and continued until the end of the exercise period. Exercise was found to augment the net protein synthesis in both the hindlimb and gut. The balance of phenylalanine during infusion in the hindlimb showed a reduction in the net release in AG compared to both G and S (P<0.05, but not AG versus S), and the net release was lower in R than in L (2.1 ± S: -3.6 ± 0.6 μmol/kg, mean±S:TE). The balance of essential amino acids in the gut showed a net uptake of both AG and AA, while G and S showed net losses. These data thus suggest that amino acid infusion before and during exercise can reduce the rate of exercise-induced protein degradation in both skeletal muscle and the gut, while, on the other hand, no significant effect can be expected for glucose.


The purpose of this study was to determine the effects of an acute bout of exercise on postexercise energy and macronutrient intake. Healthy sedentary females (n=7) and males (n=3) exercised 42 ± 33 (mean ± SD) miles during 1 hr of stationary cycling at 60% of VO2 max. Substrate oxidation was derived from respiratory exchange ratios during the exercise bout. A 60 min recovery period, subjects were presented with foods varying in macronutrient content and were allowed to eat ad libitum in a private room. The choices varied carbohydrate (CHO) content (i.e., high, simple sugar, high complex CHO, and low CHO) within high and low fat foods. In order to calculate energy and macronutrient balance, a control (no exercise) trial with indirect calorimetry measurements was also performed. Trials were completed in random order one month apart. None of the 10 subjects were in negative energy balance following the lunch test meal (343 ± 57 kcal). There was a significant positive relationship between exercise CHO utilization and post-exercise CHO intake (r = 0.31, p < 0.01). This relationship was stronger for complex CHO (r = 0.41) than for simple sugars (r = 0.19). Further, those subjects who had a greater utilization of carbohydrate during exercise were in more positive fat balance after the meal. These results suggest that in a majority of our subjects the energy expended during exercise was not compensated for in a single meal, while exercise carbohydrate utilization and postexercise carbohydrate intake were positively correlated.

2174 CARNITINE AND CAFFEINE ADMINISTRATION INCREASES FAT OXIDATION AND ENDURANCE PERFORMANCE IN ATHLETES. K. Lim, S. Cho, Y.-S. Cha and D. S. Sathan (SPON: M. Suzuki). Dept. of Athletics, Univ. of Incheon, Kyungin Women's Junior College, Incheon, Dep. of Food & Nutrition, Yonsei National Fisheries Univ., Yonsei, Korea and Dep. of Nutrition, Univ. of Tennessee, Knoxville, TN 37919.

This study examined the effects of carnitine and caffeine administration on energy substrate utilization and endurance performance. Ten trained rugby athletes (age, 19–22 y; VO2max, 83 ml kg–1 min–1) completed each of four trials 1 h after the same dietary intake (460 kcal) and breakfast: 250 ml of water containing (C) caffeine (CAF; 5 mg/kg bw), caffeine (CAR, 15 g), or complex of caffeine + carnitine (COM; 5 mg/kg caffeine and 15 g carnitine). Subjects exercised at 60% VO2max on a cycle ergometer for 45 min, and then the intensity of exercise increased to 80% VO2max. The exercise was continued to exhaustion (all-out).Expired gas and venous blood were collected. Results were analyzed using repeated measured measurements way ANOVA. COM and CAR trials were significantly increased exhaustion time. Plasma PFA level during exercise was increased by CAF, but not by COM. Respiratory quotient was decreased by CAR and COM. The results suggest that COM administration enhances fat oxidation during exercise.
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