Protein ingestion and cooling are strategies employed by athletes to improve post-exercise recovery and, as such, to facilitate muscle reconditioning following exercise. However, whether post-exercise cooling affects postprandial protein handling and subsequent muscle protein synthesis rates during recovery from exercise has not been studied.

**PURPOSE:** This study assessed the impact of post-exercise cooling on acute postprandial (hourly) and prolonged (daily) myofibrillar protein synthesis rates during recovery from resistance-type exercise over a 2-week period.

**METHODS:** Twelve healthy, male adults (age: 21±1 y) performed a single session of resistance-type exercise followed by water immersion of both legs for 20 min. One leg was immersed in cold water (8°C: CWI) while the other leg was immersed in theroneutral water (30°C: CON). After water immersion, a beverage was ingested containing 20 g intrinsically L-[1-13C]-phenylalanine and L-[1-13C]-leucine labelled milk protein with 45 g of carbohydrates. In addition, primed continuous L-[ring-2H6]-phenylalanine and L-[1-13C]-leucine infusions were applied, with frequent collection of blood samples and muscle biopsies to assess myofibrillar protein synthesis rates in vivo over a 5-h recovery period. In addition, deuterated water (2H2O) was ingested with the collection of saliva, blood and muscle biopsies over 2 weeks to assess the effects of post-exercise cooling with protein intake on myofibrillar protein synthesis rates during more prolonged resistance-type exercise training.

**RESULTS:** Incorporation of dietary protein-derived L-[1-13C]-phenylalanine into myofibrillar protein was significantly lower in CWI compared to CON (0.015±0.002 vs 0.021±0.002 MPE; P=0.016). Post-exercise myofibrillar protein synthesis rates were lower in CWI compared to CON based upon L-[1-13C]-leucine (0.058±0.003 vs 0.072±0.005%-h⁻¹, respectively; P=0.024) and L-[ring-2H6]-phenylalanine (0.042±0.003 vs 0.053±0.004%-h⁻¹, respectively; P=0.025). Daily myofibrillar protein synthesis rates assessed over 2 weeks were significantly lower in CWI when compared to CON (1.48±0.05 vs 1.67±0.11%·d⁻¹, respectively; P=0.042).

**CONCLUSION:** Cold-water immersion during recovery from resistance-type exercise impairs myofibrillar protein synthesis rates.

**REFERENCES:**
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(No relationships reported)
CONCLUSIONS: PRO_{max} does not confer additional satiating benefits in resistance-trained individuals during short-term energy deficit. Ghrelin response to a test-meal support the contention that satiety was sustained with PRO_{max}, with implication that high protein meals may be adequate to increase acute satiety when following a PRO_{max}-energy-restricted diet.

2015 Board #171
May 30 2:00 PM - 3:30 PM
**Effect Of Branched-chain Amino Acid Plus Glucose Supplement Timing On DOMS And Related Indicators After Eccentric Exercise**
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(No relationships reported)

PURPOSE: Nutrient timing is a strategic approach to maximize training effects, reduce risk of injury, and help with recovery. The present study examined the effect of BCAA plus Glucose on markers of muscle damage and Inflammation after eccentric exercise in male college students.

METHODS: 18 healthy college students were divided into control group (PLA) group and supplement (BCAA+G) group randomly. Each group was randomly assigned 4 people for pre-exercise supplementation and 4 people after exercise for the first time, and changed for the second time. Before or after supplementation, volunteers performed an eccentric exercise protocol. Muscle soreness(VAS), creatine kinase (CK), C-reactive protein (CRP) and interleukin-6 (IL-6) and 3-methylhistamine (3MH) assessments were performed before exercise and after 30min, 24, 48 hours.

RESULTS: The VAS score of the subjects increased significantly 24 hours after high-intensity eccentric exercise(2.86 vs 1.66, p<.05), and the increase of serum CK level(364.45 vs. 151.02UI/L), CRP(4.77 vs. 3.28mg/L) and IL-6(279.00 vs. 110.60pg/ml) increased significantly(p<.05); BCAA plus G supplement significantly reduced the VAS score(1.27 vs 2.86, p<.05) and CK(28.74 vs. 36.45UI/L), CRP(3.75 vs. 4.77mg/L), IL-6(164.09 vs 279.00pg/ml) levels(p<.05), compared with pre-supplementation group, post-supplementation had lower VAS score(1.27 vs. 2.63), CRP(3.75 vs. 4.26mg/L) and IL-6(164.09 vs. 226.66pg/ml) and 3MH(105.07 vs. 131.67umol/L) response at 24 h after eccentric exercise(p<.05).

CONCLUSIONS: High-intensity eccentric exercise DOMS with the elevation of damage and inflammatory markers as CK, CRP and IL-6. BCAA plus G supplementation can effectively reduce the level of DOMS, decrease muscle damage and inflammatory factors and protein breakdown. Compared with pre-exercise supplementation, post-exercise supplementation has a better effect on reducing inflammatory factors and protein breakdown caused by DOMS.

2016 Board #172
May 30 2:00 PM - 3:30 PM
**Acute Effect Of The Order Of Resistance Exercise And Nutrient Intake On Muscle Breakdown**
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Combined resistance exercise (RE) and nutrient intake synergistically interacts with muscle hypertrophic effect (MHE) (Phillips et al., 2006). Indeed, muscle breakdown (MB) is suppressed with acute RE and proper nutrient (amino acid + carbohydrate), reflected by decreases in 3-methylhistidine (3-MH), a MB marker in 24h urine collection. The study also suggested that the response of MB marker upon acute RE may reflect MHE in chronic RE training (Bird et al., 2006). However, the effect of the order of nutrient intake and RE on acute MB response remains unclear. Given that MB acutely responds to RE (Louis et al., 2007), it is important to assess acute changes in MB markers upon nutrient intake and RE.

PURPOSE: The aim of this study was to investigate the effect of the order of nutrient intake and RE on acute changes in urinary MB marker and thus MHE.

METHODS: Twelve healthy men were divided into three conditions: 1) nutrient intake before RE condition (Pre), 2) nutrient intake after RE condition (Post), and 3) RE without nutrient intake condition (No). They performed 5 types of multiple RE at 70%RM intensity. In all conditions, RE was performed from 8:30 to 9:30. The time of nutrient intake in the Pre was at 7:00, while in the Post was at 9:30. The standard Japanese lunch menu with 21 g of whey protein and 200 ml of milk (total energy, 1019 kcal; Protein, 53.4 g; fat, 25.1 g; carbohydrate, 139.5 g) was provided. Urinary samples were collected at 7:00, 10:00, 12:00, 15:00, and 18:00, and urea nitrogen (UN), creatinine (Cre), and 3-MH concentrations were measured, and 3-MH and UN, were normalized by Cre.

RESULTS: The acute responses of MB markers were validated by the result that the time-course change in the total amount of UN and UN normalized by Cre were consistent at any given time point. The area under the curve (AUC) of 3-MH was significantly higher in Pre than that in No (P < 0.01). There was no significant difference between Post and No in the AUC of 3-MH. The AUC of UN was significantly higher in Pre than that in Post (P < 0.05) and No (P < 0.01).

CONCLUSION: These results suggest that nutrient intake before RE may have no substantial MHE. Supported by Grant-in-Aid for Scientific Research from the Japanese Ministry of Education, culture, Sports Scientific, and Technology (Grants 26702029 and 15K0358).

2017 Board #173
May 30 2:00 PM - 3:30 PM
**Different Amounts Of Protein Intake Influence Body Composition And Performance In Elite Cyclists**
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PURPOSE: The ideal amount of protein intake for endurance athletes has been poorly investigated. The aim of this study was to evaluated the physiological impact of different dietary protein intakes on body composition and performance outcomes in a group of elite cyclists.

METHODS: Thirty-four elite cyclists (1600-1800 km/month) participated to the study. Subjects were divided in 4 groups with different levels of protein intake: normal (NP, 1.2 g/kg), moderate (MP, 1.6 g/kg), high (HP, 2.0 g/kg) or very high (VHP, 2.4 g/kg) protein for 8 wk. In the diets fats were maintained constant whilst energy from carbohydrate and protein was modified to maintain an isocaloric diet. Body composition was assessed via Dual X Ray Absorptiometry (DXA) and via ultrasound to calculate cross sectional area (CSA) of the anterior thigh. VO_{max}, peak power output and 1 RM half squat test were also performed.

RESULTS: After two months both HP and VHP showed a significant improvement of 1 RM (HP pre 131±14 Kg vs post 141±12 Kg, p<0.01; VHP pre 137±12 Kg vs post 144±11 Kg, p<0.01), PPO (HP pre 505±28 W vs post 534±67 W, p<0.01; VHP pre 512±55 W vs post 541±76 W, p<0.01), and VO_{max} (HP pre 62.1±5.8 mlO2/Kg vs post 64.5±5.9 mlO2/Kg, p<0.01; VHP pre 61.2±5.3 mlO2/Kg vs post 64.1±7.6 mlO2/Kg, p<0.01), without differences between groups. There were no significant changes of 1 RM and VO_{max} for both NP and MP whilst NP showed a significant decrease of PPO. Both HP and VHP showed a significant increase of lean body mass (LBMI) (HP pre 64.7±1.9 Kg vs post 65.9±4.2 Kg, p<0.01; VHP pre 65.5±2.0 Kg vs post 67.6±4.1 Kg) whilst both NP and MP showed a significant decrease (NP pre 63.3±1.2 Kg vs post 62.4±2.3, p<0.05; MP pre 66.8±1.8 Kg vs post 65.8±2.9 Kg). HP and VHP showed a significant increase of anterior thigh CSA (HP pre 50.5±7.8 cm² vs post 53.4±6.7 cm², p<0.01; VHP pre 51.2±6.5 cm² vs post 54.1±7.6 cm²). No changes of blood volumes are detected.

CONCLUSIONS: Our data suggest that an higher protein intake (2.0 and 2.4 g/kg) may help elite cyclists to improve performance and to increase muscle mass without differences between the two levels of protein intake. Instead 1.2 and 1.6 g/Kg of protein seemed to be not sufficient and could impair performance and muscle mass.