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An Acute Increase of Dietary Protein Intake Elicits Positive Cellular Metabolic Adaptations in Healthy Males.

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Abstract:
There is emerging literature demonstrating that restricting dietary carbohydrate (CHO) intake might upregulate cellular markers of mitochondrial biogenesis. Mitochondria quantity and density has been linked with increased endurance performance, reduction in type 2 diabetes and improved insulin sensitivity. A number of transcriptional cellular markers have been identified as key regulators of this process. **PURPOSE:** To determine the influence of 7 days dietary manipulation on resting metabolic rate (RMR), body composition and transcriptional markers of mitochondrial biogenesis. **METHOD:** Forty-six healthy male participants (mean ± SD; age (years), body mass (kg), height (cm); 28 ± 5, 75.6 ± 11.1, 178.0 ± 4.9, respectively) were recruited and randomised to one of four conditions: energy matched high protein (PRO-EM), energy restricted high protein (PRO-ER), energy matched high carbohydrate (CHO-EM) or energy restricted high carbohydrate (CHO-ER). Macronutrient ratios (PRO:CHO:FAT) of 40:30:30 and 60:10:30 were used for high protein and high carbohydrate conditions, respectively. Calorific intake for energy restricted groups was matched to RMR. Participants visited the laboratory on 3 occasions across 15 days. On days 0, 7 and 15 participants completed assessments of body composition (DEXA) and RMR (indirect calorimetry), prior to providing a muscle biopsy from the vastus lateralis for later analysis of transcriptional markers via real-time polymerase chain reaction. Between days 1 & 7 and 7 & 14 participants consumed their habitual and prescribed diets, respectively. Laboratory testing was completed following an overnight fast and at the same time of day on each occasion. **RESULTS:** No difference in RMR was observed in any group across all time points. AMPK, PGC-1a, SIRT1 and PPAR expression was increased in the PRO-ER group (1.32, 1.20, 1.45 and 1.41 fold, respectively). Transcriptional markers were not affected in either CHO group. The CHO-ER group demonstrated a greater loss in lean mass relative to the PRO-EM (-2.22 vs -0.35%,) and body mass loss relative to both CHO-EM and PRO-EM (-2.85 vs -0.95 vs -1.47%) ($P < 0.05$). **CONCLUSION:** A restriction energy intake combined with increased protein consumption for 7 days increases transcriptional markers of mitochondrial biogenesis.