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# Effects of different carbohydrates and protein recovery mixtures on exogenous and endogenous substrate oxidation during subsequent exercise

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## Background

A randomized, double-blind, placebo-controlled study was performed to evaluate the effect of adding protein (PRO) to a recovery mixture on exogenous and endogenous substrate oxidation during post-recovery exercise. Many studies have shown that carbohydrates (CHO) effectively restore glycogen post-exercise [1]. Some have also suggested that the addition of PRO to a CHO drink may produce further improvements [2]. CHO and PRO ingestion during recovery may result in higher CHO oxidation during subsequent exercise, which may be more beneficial to endurance performance because of preservation of endogenous substrates [3].

## Methods

With institutional ethics approval six well-conditioned men [age: 34.0 yrs ± 8.2; body mass (BM): 75.6 kg ± 7.1; max: 62.5 ml•kg BM-1•min-1 ± 6.5] completed a depletion protocol, followed by a 4-hour recovery period, and a subsequent 60 min cycle at 65% max on 3 occasions. During recovery subjects ingested either a placebo (PL), MD+13C-GAL+PRO (highly naturally enriched maltodextrin, 13C-labelled galactose, whey protein hydrolysate, L-leucine, L-phenylalanine; 0.5 +0.3 +0.2 +0.1 +0.1 g•kg BM-1•h-1) or MD+13C-GAL (0.9 +0.3g•kg BM-1•h-1) drink. O2 consumption (L/min) and CO2 production (L/min) were analyzed using breath-by-breath methodology (Metalyzer 3B, Cortex, Leipzig, Germany). Samples of expired air for determination of the 13C enrichment were collected every 15 min of the post-ingestion exercise. Data expressed as means ± s. Statistical significance set at $p \leq 0.05$.

## Results

The mean rate of exogenous CHO oxidation ($g \cdot min^{-1}$) after MD+$^{13}$C-GAL vs. MD+$^{13}$C-GAL+PRO was: 1.80 ± 0.26 vs. 1.60 ± 0.18 (at 15 min), 1.85 ± 0.17 vs. 1.61 ± 0.17 (at 30 min), 1.88 ± 0.13 vs. 1.59 ± 0.20 (at 45 min), and 1.81 ± 0.12 vs. 1.47 ± 0.22 (at 60 min), respectively. The mean rate of endogenous CHO oxidation ($g \cdot min^{-1}$) after MD+$^{13}$C-GAL vs. MD+$^{13}$C-GAL+PRO was: 1.33 ± 0.21 vs. 1.66 ± 0.31 (at 15 min), 0.95 ± 0.31 vs. 1.27 ± 0.40 (at 30 min), 0.72 ± 0.25 vs. 1.47 ± 0.20 (at 45 min), and 0.78 ± 0.26 vs. 1.64 ± 0.22 (at 60 min), respectively. Differences between conditions were statistically significant at 45 and 60 min ($p < 0.02$). 38.8% of the total ingested CHO dose was oxidized after MD+$^{13}$C-GAL+PRO, which was 8.5% higher than in the MD+$^{13}$C-GAL trial (30.3%). The contribution of exogenous CHO, endogenous CHO and fat towards the total energy expenditure was: 0, 38.6, 61.4% (PL), 40.7, 20.7, 38.6% (MD+$^{13}$C-GAL), 34.2, 33.1, 32.7% (MD+$^{13}$C-GAL+PRO), respectively.

## Conclusion

These results suggest that the inclusion of PRO in the mixture results in a higher amount of total CHO oxidized. However, at the same time adding PRO to the drink seems

to increase endogenous CHO oxidation and decrease exogenous CHO and fat oxidation. On the other hand, MD+$^{13}$C-GAL seems to promote higher contribution of exogenous CHO and fat but lower endogenous CHO to total energy expenditure, which is believed to be more beneficial to endurance performance.

## References

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