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Research article

Substrate Utilization is Influenced by Acute Dietary Carbohydrate Intake in Active, Healthy Females

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ABSTRACT

The present study compared the metabolic responses between a single low-carbohydrate (LC) and low-fat (LF) meal followed by an aerobic exercise bout in females. Subjects included 8 active, premenopausal females. Subjects completed a LC and LF testing session. Respiratory gas exchange (RER) measurements were taken for 20 min fasted, for 55 min postprandial (PP), and during 30 min of exercise. Blood was collected for assessment of glucose (G), insulin (IN), triglycerides (TG), and free fatty acids (FFA) during the final 10 min of each time period. The LF meal provided 396 kcal (78% carbohydrate, 7% fat, and 15% protein). The LC meal provided 392 kcal (15% carbohydrate, 68% fat, and 18% protein). No significant differences existed between test meals for fasting blood measurements. PP IN ($\mu\text{U}\cdot\text{mL}^{-1}$) levels were significantly lower following LC compared to LF [10.7 (6.1) vs. 26.0 (21.0)]. Postexercise (PE) FFA ($\text{mEq}\cdot\text{L}^{-1}$) levels were significantly greater following LC [1.1 (0.3) vs. 0.5 (0.3)]. PE TG ($\text{mg}\cdot\text{dL}^{-1}$) levels were significantly greater following LC [152.0 (53.1) vs. 114.4 (40.9)]. RER was significantly lower at all time points following LC compared to LF. In moderately active adult females, ingestion of a single LC meal resulted in greater lipid oxidation at rest and during exercise as compared to a single LF meal. Although macronutrient distribution appears to have dictated substrate utilization in the present study, more research is needed regarding the long-term effects of macronutrient redistribution with and without exercise on substrate utilization.

Key words: Macronutrient distribution, exercise, low-carbohydrate

Key Points

- The relative carbohydrate content of a single meal has a significant impact on postprandial metabolism and substrate utilization in healthy, active females.
- A single bout of aerobic exercise performed within an hour of meal ingestion has the potential to modify the postprandial response.
- Interventions aimed at improving body composition and preventing chronic disease should focus on dietary macronutrient redistribution and postprandial metabolism in concert with exercise training.

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