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Low and High Carbohydrate Diets on Performance, Metabolism and Cardiometabolic Health in Middle-Aged Athletes

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High carbohydrate, low fat (HCLF) diets have been the predominant eating strategy for athletes for performance, but recent evidence has challenged the superiority of HCLF over low carbohydrate, high fat (LCHF) diets, along with growing interest in the potential health and disease implications of dietary choice. **PURPOSE:** To evaluate the effects of 4-week habituation to either an LCHF or HCLF diet on (i) high-intensity short duration exercise performance, (ii) oxidation rates, and (iii) continuous glycaemic, and cardiometabolic biomarker changes. **METHODS:** Ten highly trained middle-aged male runners (age 39.9 ± 5.1 years, height 181.7 ± 8.8 cm, weight 86.7 ± 12.5 kg; VO_{2max} 58.7 ± 5.2 ml/kg/min) consumed an ad libitum LCHF and HCLF diet in a random order, each for 31 days in a crossover design. Each subject completed a one-mile (1,560m) running time trial (TT), repeated sprint protocol (RSP; 6x800m), assessment of body composition and cardiometabolic parameters before (PRE) and at the completion (POST) of each 31-day dietary intervention. Participants interstitial glucose concentrations were measured throughout each dietary intervention via continuous glucose monitoring (CGM). Gas exchange were recorded throughout each performance trial. **RESULTS:** We demonstrated: (i) equivalent high-intensity exercise performance for one-mile TT ($M_{diff} = 6.9$ sec; $p = 0.159$, $\square^\square p = 0.208$), RSP ($M_{diff} = 17.9$ sec; $p = 0.556$, $\square^\square p = 0.040$), fasting insulin ($M_{diff} = 0.32$ µU/ml; $p = 0.350$, $\square^\square p = 0.097$), high-sensitivity C-reactive protein ($M_{diff} = 0.18$ mg/l; $p = 0.134$, $\square^\square p = 0.232$), hemoglobin A1c ($M_{diff} = 0.09$ %; $p = 0.388$, $\square^\square p = 0.084$); (ii) record high peak fat oxidation rates on the LCHF diet (LCHF:1.58 ± 0.33g/min @ 86.40 ± 6.24% VO_{2max}; 30% subjects >1.85g/min); (iii) elevated total (Δ: 20.7 ± 3.3 mg/dL; $p = 0.001$), LDL (Δ: 10.7 ± 4.6 mg/dL; $p = 0.03$), and HDL cholesterol (Δ: 11.4 ± 3.3 mg/dL; $p = 0.045$) on LCHF diet, and; (iv) reduced mean glucose on LCHF (mean: 15.0%; range: -34.3% to 0.7%; $p = 0.006$). **CONCLUSION:** These results (i) challenge whether higher carbohydrate intake is superior for athletic performance, even during shorter-duration, higher-intensity exercise; and (ii) demonstrate that lower carbohydrate intake may be a therapeutic strategy, to improve blood glucose control in athletes.