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Physiological, Perceptual and Performance Effects of a Novel Energy-dense Ketogenic Bar

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We recently demonstrated that a novel ketogenic nutrition bar (KB), consumed 3h before rucking exercise (~50% of $\text{VO}_{2\text{max}}$; 14% grade, 2mph, 30% of body weight rucksack), produces similar time-to-exhaustion results to isocaloric high carbohydrate bars (CB). Based on our prior findings, we hypothesized that these results could be extrapolated to a 5-km running time trial (TT). **PURPOSE:** To explore whether acute ingestion of carbohydrate or lipid-based nutritional bars before a 5-km TT elicit unique advantages that can augment aerobic exercise performance. **METHODS:** In a randomized single-blind crossover design, recreational male distance runners ($n = 11$; age: 22 ± 4 yrs., height: 180.1 ± 10.2 cm, mass: 80.1 ± 12.3 kg, $\text{VO}_{2\text{max}}$: 58.0 ± 6.9 ml/kg/min) completed two sessions – a 5-km running TT familiarization and a $\text{VO}_{2\text{max}}$ test – followed by two subsequent 5-km TTs, 3h after consuming 1000 kcal from a novel energy-dense KB (%en from carbohydrate/fat/protein: 5/83/12) or isocaloric CBs (52/30/18). Conditions were separated by a 1-week washout. Blood R - β HB, glucose, lactate, plus subjective measures of fullness and thirst, were measured at baseline, 30 min post-ingestion, pre-exercise, and post-exercise. Total time to completion, heart rate (HR), rating of perceived exertion (RPE), affect, respiratory exchange ratio (RER), oxygen consumption (VO_2), carbon dioxide production (VCO_2) was measured throughout exercise. **RESULTS:** The 5-km TT performance was similar between conditions (CB: 23.9 ± 2.5 min, KB: 23.4 ± 2.6 min, $p = 0.177$). No differences were detected in HR, VO_2 , VCO_2 , RPE, and affect (all $p > 0.05$). The RER was significantly higher after CB ingestion (CB: 0.95 ± 0.04 , KB: 0.90 ± 0.04 , $p = 0.002$). Substrate oxidation rates for fat (CB: 0.3 ± 0.3 g/min; KB: 0.6 ± 0.3 g/min; $p = 0.003$) and carbohydrate (CB: 5.7 ± 0.9 g/min; KB: 6.2 ± 0.9 g/min; $p < 0.0001$) were augmented by KB ingestion. Capillary R - β HB increased modestly after the KB ingestion ($p = 0.009$), while blood glucose increased after CB only ($p = 0.010$). Lactate increased during the TT independent of the condition ($p < 0.0001$). Participants perceived the KB as 59% more filling than the CB ($p = 0.002$). **CONCLUSION:** A novel KB produced equivalent 5-km TT results and elicited greater metabolic flexibility compared to an isocaloric CB. **SIGNIFICANCE/NOVELTY:** Individual responses to alternative, pre-race nutritional snacks – varying in lipid and carbohydrate content – may prospectively help coaches to develop precision nutrition strategies for athletes who wish to maximize their 5-km TT performance.

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