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Influence of a low-carbohydrate diet on thermoregulatory responses to exercise in women during follicular and luteal phase of the menstrual cycle

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The aim of this study was to examine the effects of a low-carbohydrate diet on thermoregulatory responses to exercise in women during follicular (F) and luteal (L) phase of the menstrual cycle. Ten subjects performed a graded bicycle exercise in a thermoneutral environment (23°C, 52-60% relative humidity). Women were tested after consuming, for 3 days, a control diet (C: 60% carbohydrates, 20% fat, 20% protein) and after that a low-carbohydrate diet (LCHO: 50% fat, 35% protein and 5% carbohydrates), in each phase of the menstrual cycle. Tympanic temperature (Tty), mean skin temperature (Tsk), electrical skin resistance (ESR), oxygen uptake (VO₂), heart rate (HR) as well as blood β-hydroxybutyrate acid (β-HB), glucose (Glu) and lactate (LA) concentrations were measured. On the basis of ESR, dynamics of sweating was estimated. No differences in Tty and Tsk were found between the C and LCHO during exercise tests. However, Tty was significantly higher during L than F phase. Delay time for sweating was shorter after LCHO (F: 10.8 vs 9.4 min, P<0.05, L: 9.9 vs 9.3 N.S.), but temperature threshold for this reaction was unchanged (L: 37.22 vs 37.37 and F: 36.91 vs 36.94 °C). Sweating sensitivity was greater after LCHO during both F and L. Resting blood Glu and LA concentrations were similar in women after C and LCHO diet. Before exercise β-HB level was F: 0.45, L: 0.35 mM after LCHO and F: 0.08, L: 0.09 mM after C diet (P<0.05), respectively. At rest and during exercise HR was significantly higher after LCHO diet in women during F phase. In submaximal exercise loads VO₂ after LCHO diet were significantly higher than after C diet in all women. It was concluded that the low-carbohydrate diet ingested by young women in both phases of the menstrual cycle have no effect on body temperature, however, it affects heat dissipation mechanism during exercise.

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