28th ECSS Anniversary Congress, Paris/France, 4-7 July 2023

Low- vs high-carbohydrate diet on continuous glucose monitoring metrics and performance in competitive cyclists: a randomized crossover trial

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INTRODUCTION:
Continuous glucose monitors (CGM) recording minute-by-minute interstitial glucose levels have recently gained popularity among professional endurance athletes for their purported benefits of monitoring and optimizing fueling adequacy around training sessions and competitions, as carbohydrate intakes between and within days are usually arranged according to the goal and the fuel requirements of each training session (1). While GCM use is supported by evidence among active and non-active diabetes patients, data on healthy athletes is still very limited (2). This study aimed to examine the glycemic responses to a short-term low-carbohydrate or high-carbohydrate diet in healthy competitive cyclists while wearing a CGM.
METHODS:
This randomized crossover-designed study recruited 13 competitive cyclists with more than 8 hours of training per week (29±10 years, 174±7 cm, 70±9 kg, 309±42 WCP). Participants were asked to follow a 3-day standard run-in diet, followed by 7 days of either a low-carbohydrate (<130 g/day) or high-carbohydrate diet (> 5 g/kg/day) in a randomized order, while a CGM (Abbott Libre Sense) measured their interstitial glucose for 14 consecutive days. On the last day of each diet period, participants underwent a 3-hour training session, including two 3-minute all-out intervals at the start and at the end of the session, and power data was recorded. Glucose data was divided into sleep and wake phases and analyzed using the iglu Shiny app. Mean glucose levels, coefficient of variation (CV), and mean amplitude of glycemic excursion (MAGE) metrics were considered as main outcome variables. A MANOVA for repeated measures was conducted to test differences between diet periods.
RESULTS:
When analyzing the treatment (diet) effect, no significant variations were reported for any of the collected variables, neither during sleep nor wake time (all $p \geq 0.05$). A different glucose distribution over time in the zones (<70, 70<x<120, >120 mg/dL) was reported, with the high-CHO period showing a wider distribution in the three zones. When participants consumed the diet high in carbohydrates, average power was higher in both 3-minute intervals (+5.9±5.5%, $p < 0.01$), and there was a smaller decrease in power output between the initial and final burst (-5.1±4.5%, $p = 0.003$) compared to the low-carbohydrate week (-6.6±5.1%, $p = 0.002$).
CONCLUSION:
While CGM may provide a fast and an easy snapshot of interstitial glucose levels, in this study glucose metrics seemed to not be influenced by diet in healthy competitive cyclists. However, performance during the 3-min bout was worse in the low-CHO period, as well as the within session power decrement. The usefulness of this technology for optimizing off- and on-the-bike fueling strategies to improve training adaptations and performance remains to be determined and requires further investigation.

REFERENCES:
Impey et al., Sports Medicine, 2018
Scott et al., Pract Diab., 2022

Topic: Nutrition

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