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Rethinking fat as a fuel for endurance exercise

Jeff S. Volek, Timothy Noakes & Stephen D. Phinney

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Abstract

A key element contributing to deteriorating exercise capacity during physically demanding sport appears to be reduced carbohydrate availability coupled with an inability to effectively utilize alternative lipid fuel sources. Paradoxically, cognitive and physical decline associated with glycogen depletion occurs in the presence of an over-abundance of fuel stored as body fat that the athlete is apparently unable to access effectively. Current fuelling tactics that emphasize high-carbohydrate intakes

accelerate the body's ability to oxidize fat is to lower dietary carbohydrate intake to a level that results in nutritional ketosis (i.e., circulating ketone levels >0.5 mmol/L) while increasing fat intake for a period of several weeks. The coordinated set of metabolic adaptations that ensures proper interorgan fuel supply in the face of low-carbohydrate availability is referred to as keto-adaptation. Beyond simply providing a stable source of fuel for the brain, the major circulating ketone body, beta-hydroxybutyrate, has recently been shown to act as a signalling molecule capable of altering gene expression, eliciting complementary effects of keto-adaptation that could extend human physical and mental performance beyond current expectation. In this paper, we review these new findings and propose that the shift to fatty acids and ketones as primary fuels when dietary carbohydrate is restricted could be of benefit for some athletes.

Keywords: Metabolism, nutrition, performance

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