

Title of Presentation

Exogenous ketone supplements: What does the science tell us?

Abstract

Optimising training and performance through nutrition strategies is central to supporting elite sportspeople, much of which has focused on manipulating the relative intake of carbohydrate and fat and their contributions as fuels for energy provision, and provision of protein during recovery from exercise. The ketone bodies, namely acetoacetate, acetone and β -hydroxybutyrate (β HB), are produced in the liver during conditions of low glucose availability. Ketone bodies have pleiotropic effects in multiple organs including brain, heart, and skeletal muscle by serving as an alternative substrate for energy provision, and by modulating inflammation, oxidative stress, catabolic processes, and gene expression. Of note are the metabolic actions of ketone bodies to alter substrate utilisation through attenuating glucose utilisation in peripheral tissues, anti-lipolytic effects on adipose tissue, and attenuation of proteolysis in skeletal muscle. There has been long-standing interest in the development of ingestible forms of ketone bodies that has recently resulted in the commercial availability of exogenous ketone supplements. These supplements in the form of ketone salts and ketone esters, in addition to ketogenic compounds such as 1,3-butanediol and medium chain triglycerides, facilitate an acute transient increase in circulating AcAc and β HB concentrations, which has been termed 'acute nutritional ketosis' or 'intermittent exogenous ketosis'. A large number of studies have been performed in the past decade investigating the potential benefits of exogenous ketone supplements for exercise performance and recovery, but results are equivocal are present. Apart from exercise performance and recovery, ketone bodies can act as signalling metabolites, with β HB acting as an inhibitor of activity of histone deacetylases and the NLRP3 inflammasome, in addition to β HB having anti-catabolic activity and acting as a substrate for the failing heart. These effects suggest potential therapeutic applications beyond a direct role as an ergogenic aid for athletic performance.