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Conference Abstract

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Exogenous lactate supplementation: 28-day ingestion of a novel lactate-ketone ester is feasible, safe, and increases haematocrit. Data from a double-blind, randomized, controlled crossover trial

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1 Abstract

1.1 Introduction

Ketone supplements, such as ketone monoesters and ketone diols, have been used over the past decade to improve athletic performance, particularly recovery in elite cyclists. Exogenous lactate is less extensively investigated and has predominantly been administered as sodium lactate, which is associated with severe gastrointestinal side effects. Lactate supplementation has been proposed as a potential ergogenic aid, as lactate is endogenously preferred over glucose as a fuel during exercise.

Here, we introduce a novel lactate–ketone ester, (R)-1,3-butanediol (S)-lactate ester (LaKe), which provides dual supplementation with lactate and the ketone body beta-hydroxybutyrate (BHB) and exhibits metabolism similar to that of ketone monoesters. In this first human clinical study of LaKe, we report: (1) circulating concentrations of lactate and BHB following ingestion of 25 mL LaKe; (2) preliminary feasibility and safety of 28 days of LaKe supplementation; and (3) hematological adaptations in otherwise healthy adults living with obesity.

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1.2 Material and methods

In a double-blind, randomized, controlled crossover study, 10 healthy participants with obesity received 28-day LaKe and taste-matched noncaloric placebo (PLA) regimens of 2 daily doses (25 mL/dose) separated by a 28-day washout period. After each intervention period, participants were studied on day 29 after an overnight fast before consuming the allocated intervention followed by continuous blood sampling. Gastrointestinal tolerability was assessed via the Beverage Tolerability Questionnaire (BTQ).

1.3 Results

Ten healthy participants with obesity were included (5 men; age 44 ± 7 years; all Caucasian). Following LaKe ingestion, lactate and BHB concentrations peaked at 2.15 mM (IQR: 1.50–2.65) and 0.60 mM (IQR: 0.50–0.70), respectively. No significant changes in heart rate, blood pressure, or organ-specific biomarkers were observed after 28 days of twice-daily ingestion of either LaKe or PLA (all $P > 0.05$).

Nausea and diarrhea were more frequent in the LaKe condition (both $P = 0.07$) and were overall characterized as mild to moderate gastrointestinal side effects. No participants reported tolerability issues related to the cardiovascular, respiratory, or musculoskeletal systems. We observed an increase in hematocrit (0.40 vs. 0.39; paired difference 0.01 [95% CI: 0.00–0.01], $P = 0.011$), which was not associated with circulating erythropoietin (EPO; $P = 0.37$), markers of erythropoiesis or hemolysis, or biomarkers related to hydration status (all $P > 0.05$).

1.4 Conclusions

LaKe simultaneously elevates circulating BHB and lactate concentrations without affecting safety biomarkers. Twenty-eight days of intermittent exogenous ketosis and hyperlactatemia appears feasible and safe, although associated with mild to moderate gastrointestinal side effects. LaKe increased hematocrit through currently unknown mechanisms. Further studies are warranted to determine whether LaKe supplementation influences athletic performance and/or recovery.