Can acute ingestion of Citrulline Malate alter substrate utilisation during a cardiorespiratory exercise test with healthy participants?

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Introduction

- Ingestion of Citrulline Malate (CM) has been shown to improve exercise with beneficial effects reported during strength-based assessments and time trial performance\(^1\).
- CM has been reported to increase plasma arginine availability (see figure 1) and subsequent nitric oxide (NO) production, leading to increased blood flow.
- Citrulline, in particular, accelerates the ureagenesis cycle resulting in the removal of ammonium, while Malate is essential for oxidative metabolism which regulates skeletal muscle functions including glucose and fatty acid oxidation.
- Despite this, the metabolic influence of CM has received little attention in the literature. Much of the current literature has primarily focused on performance outcomes during high intensity exhaustive exercise.
- The purpose of this study was to investigate the effects of CM on substrate utilisation during a low-to-moderate cardiorespiratory exercise test.

Methods

- Respiratory data was subsequently entered into stoichiometric equations to calculate fatty acid oxidation (FAO; g·min\(^{-1}\)) and carbohydrate oxidation (CHO; g·min\(^{-1}\)), equations 1 and 2 respectively.\(^2\)
  
  \[(1) \text{FAO} = 1.695 \times \text{VO}_2 - 1.701 \times \text{VCO}_2\]
  
  \[(2) \text{CHO} = 4.585 \times \text{VCO}_2 - 3.226 \times \text{VO}_2\]

- Data Analysis: A paired samples t-test was conducted to compare the time to complete the exercise test following either CM or PLA consumption.

Results

- There was no significant difference reported for the time (min) to complete the exercise test (\(P>0.05\)). No statistical difference was found between conditions for FAO and CHO (g·min\(^{-1}\)) at any time point (see figure 2).
- All other data showed no significant difference (all \(P>0.05\)) in the pre-exercise rest period or at any stage during the exercise test. Main effects similarly showed no significant difference (\(P>0.05\)).

Summary and Conclusion

- Under strict, controlled laboratory conditions and the use of randomisation in design, this novel control trial compared the effects of a low-dose of CM to a PLA under low-to-moderate intensity exercise.
- Interestingly, this experiment found little to support the hypothesis of CM influencing metabolism under these conditions with healthy participants.
- These findings add to a growing research area on CM supplementation and adaptions to this type of trial are possible (dosage/exercise test/sample) for further study.

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References