Substrate metabolism at rest and during steady-state cycling following four weeks of n-3 PUFA supplementation

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ABSTRACT

Omega-3 polyunsaturated fatty acids (n-3 PUFA) can mediate numerous biological processes, including changing skeletal muscle membrane composition. Given the metabolic role of skeletal muscle, n-3 PUFA supplementation may influence fuel metabolism at rest and/or during exercise. Purpose. This study aimed to investigate the effects of n-3 PUFA supplementation both at rest and during steady-state exercise in endurance-trained individuals. Methods. Twenty-one male cyclists and triathletes underwent two experimental trials separated by four weeks. During this period participants were supplemented twice daily with a juice based drink containing fish oil with 2 g EPA and 2 g DHA, or a taste-matched control drink containing no fish oil. During the experimental trials, expired gas was collected at rest and during 60 minutes of cycling at 85% of the individual lactate threshold. Results. n-3 PUFA supplementation significantly increased RER when compared to the control (p<0.05). Conclusion. Our findings are generally contradictory to previous research.

METHODS

1. n-3 PUFAs mediate a number of different biological roles such as metabolism and therefore may alter substrate storage and oxidation.
2. Improved insulin sensitivity (Tsitouras et al., 2008) and glucose storage (Stephens et al., 2014) has been observed with an uptake of n-3 PUFAs into cell membranes of various tissues.
3. In a glucose fed state, n-3 PUFA supplementation has improved metabolic flexibility, and reduced fatty acid oxidation. Whereas in a fasted state human myotubes have shown an increase in fat oxidation (Hessvik et al., 2010).
4. On this basis, it is possible that n-3 PUFA may regulate substrate use at rest and during exercise differently in the fasted state.

AIM

To investigate the effect of n-3 PUFA supplementation on substrate utilisation at rest and during exercise in endurance-trained individuals.

INTRODUCTION

1. Our findings are generally contradictory to previous research.
2. Previous literature has not found any changes in RER at rest with previous literature. However, a larger dose and longer duration supplementation of n-3 PUFAs may explain the differences in findings.
3. We speculate that an increase in body mass with n-3 PUFA supplementation may be due to an increase in glycogen storage.
4. Future research should examine the effects of glycogen storage following n-3 PUFA supplementation.

RESULTS

Supplementation of 4g·d⁻¹ of n-3 PUFAs over a 4 week period increases respiratory exchange ratio and carbohydrate oxidation as well as decreasing fat oxidation during steady-state cycling.

DISCUSSION

We would like to thank Smartfish nutrition Ltd. for providing the supplements for this project.