Supplement burns muscle fat, improves exercise performance

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A new study has shown for the first time that taking a particular food supplement increases muscle carnitine content and reduces muscle carbohydrate use, while increasing fat used for energy production during exercise.

Researchers at The University of Nottingham's School of Biomedical Sciences found that recreational athletes who took a dietary supplement containing L-carnitine — a nutrient found in common food sources — combined with carbohydrates showed several metabolism benefits during low- and high-intensity exercise and improved exercise performance.

Professor Paul Greenhaff, Professor of Muscle Metabolism at Nottingham and lead author of the research, said: "This is the first study in healthy humans showing that muscle L-carnitine content can be influenced by dietary means, and that L-carnitine plays a dual role in skeletal muscle fuel metabolism during exercise that is dependent on exercise intensity."

Previous studies indicated human muscle does not respond to dietary L-carnitine supplements. This new research shows that taking an L-carnitine and carbohydrate supplement alters muscle fuel use, reduces lactic-acid build-up (which causes fatigue) and improves exercise performance.

L-carnitine plays a critical part in energy metabolism. It shuttles long-

chain fatty acids into the cells' mitochondria where they are broken down for energy generation, as well as maintaining muscle carbohydrate oxidation and offsetting lactate production during intense exercise.

The Nottingham research showed that combining L-carnitine supplements with a carbohydrate supplement increased muscle carbohydrate content by about 20 per cent via an insulin-dependent mechanism. During low-intensity exercise, 50 per cent less muscle carbohydrate was used indicating that muscle fat was favoured for fuel instead. During high-intensity exercise, muscle carbohydrate oxidation was increased and lactic-acid accumulation reduced.

Collectively, these metabolic effects resulted in a reduced perception of effort and increased work output during a validated exercise performance test. "Most L-Carnitine studies to date have been focused on cardiac-based research, not skeletal muscle," Professor Greenhaff added. "These findings should spur a fresh round of research in this area."

The Nottingham research is published in the *Journal of Physiology* (589.4 (2011) pp 963-973). Novel technology arising from this research is protected by patent application WO/2004/082674 owned by The University of Nottingham, pending in Europe and North America, and granted in Australia.

In the randomised double-blind study conducted by the University's School of Biomedical Sciences at Nottingham's Medical School, 14 healthy male volunteers with an average age of 25.9 years and a Body Mass Index (BMI) of 23 performed exercise tests.

One involved 30 minutes of cycling at 50 per cent of the maximum oxygen use capacity (VO2 max), and another involved 30 minutes at 80 per cent VO2 max. Then they each did a 30-minute work output

performance trial. This happened on three visits each separated by 12 weeks and muscle biopsies were obtained at rest and following each bout of exercise.

After the first visit, the 14 men consumed either 80g of carbohydrate, or 2g of L-carnitine-L-tartrate in the form of Carnipure™ manufactured by Swiss food-grade L-Carnitine supplier Lonza Ltd combined with 80g of carbohydrate twice daily for 24 weeks. Carnipure™ is easily integrated into dietary supplements and functional foods and beverages.

Muscle total carnitine (TC) increased by 21 per cent in the carnitine group after six months supplementation and was unchanged in the control group.

The Clinical Translational Research work of Professor Greenhaff and his team is just one example of world-leading investigations into human physiology at Nottingham. Recently, the University established Research and Knowledge Transfer Priority Groups as areas of key focus supporting its delivery of research excellence.

Provided by University of Nottingham