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Short term oral conjugated linoleic acid supplementation enhanced glycogen synthesis in exercised human skeletal muscle

Submission date
01/08/2013

Recruitment status
No longer recruiting

Registration date
16/08/2013

Overall study status
Completed

Last Edited
23/08/2013

Condition category
Nutritional, Metabolic, Endocrine

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
Skeletal muscle is the most important tissue involved in the regulating the breakdown of sugar and fat in the human body. Previous studies showed that conjugated linoleic acid (CLA) had advantages for reducing body fat mass in mice and human beings. Glycogen, a substance that releases carbohydrates, serves as a main fuel source in the skeletal muscle for endurance physical activity. There has been very less research about whether giving CLA can increase glycogen content in exercised human skeletal muscle. The aim of this study is to find that out.

Who can participate?
Male athletes aged about 20 years participated in this study.

What does the study involve?
Twelve male subjects were randomly allocated to groups: one received CLA (4.0 g per day orally) and the other, placebo (dummy). On the day of the experiment, subjects performed a 60-min cycling exercise and then consumed a high carbohydrate meal immediately after. Muscle samples were taken immediately and after 3 hours of exercise. Simultaneously, blood samples were collected every 30 min during 3-hour recovery. The groups were then crossed over after eight weeks where participants in the control group receive CLA supplementation..

What are the possible benefits and risks of participating?
All participants had a chance to gain a valuable experience by the experimental procedures. There were no risks of physical and mental injury or harm. These results will provide new evidence that oral CLA supplementation may increase production of glycogen in exercised human skeletal muscle.

Where is the study run from?
Exercise physiology laboratory in National Taichung University of Education, Taiwan.

When is the study starting and how long is it expected to run for
The study started in August 2011 and ran until July 2012.

Who is funding the study?
This study was funded from National Science Council, Taiwan.

Who is the main contact?
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Contact information

Type(s)
Scientific

Contact name
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Additional identifiers

Protocol serial number
N/A

Study information

Scientific Title
Conjugated linoleic acid enhanced glycogen synthesis

Acronym
CLA

Study objectives
We hypothesized that CLA supplementation following 1 h exercise may alter the rate of glycogen synthesis in human skeletal muscle corresponding with changes of glucose transporter type 4 (GLUT4) and P-Akt protein expression.

Ethics approval required
Old ethics approval format

Ethics approval(s)
The entire study design and all protocols were approved by the National Taiwan University of Physical Education and Sport Ethics Committee. The nature, purpose and possible risks involved in this study were thoroughly explained to each subject before taking the written statement from subjects.
National Taiwan University of Physical Education and Sport Ethics Committee (NTUPES) approved on the 28th December 2010.

Study design
Randomised crossover study

Primary study design
Interventional

Study type(s)
Screening

Health condition(s) or problem(s) studied
Sports nutrition and ergogenic aids

Interventions
The trial order for the 12 subjects was randomized so that six subjects started with eight weeks CLA trial, while six subjects started with eight weeks placebo trial.

Subjects participated in this crossover designed study, and received CLA (4.0 g/day) or placebo supplementations for 8 weeks. In this research project, we chose CLA dose 4.0 g for 8 weeks as oral supplement based on a previous human study (Eyjolfson et al., 2004).

Twelve male subjects completed a randomized cross-over trial with CLA (4.0 g per day) or placebo by separation of eight weeks. On the day of experiment, subjects performed a 60-min cycling exercise at 75% VO2max and then consumed a high carbohydrate meal (2 g carbohydrate /kilogram body weight, 80% carbohydrate, 8% protein, 12% fat) immediately after cycling exercise. Biopsied muscle samples were taken from vastus lateralis immediately and 3-h following exercise. Simultaneously, blood and gaseous samples were collected every 30-min during 3-h recovery. The decision for CLA dosage was based on previous human report which demonstrated positive ergogenic effect on endurance performance.
Subjects performed a 60-mins cycling at 75% VO2max. Muscle biopsy samples, blood samples and gaseous samples were obtained immediately after exercise and during 3 hours after exercise.

Intervention Type
Drug

Phase
Not Applicable

Drug/device/biological/vaccine name(s)
Linoleic acid

Primary outcome(s)
Glycogen assay: approximately 25 mg of skeletal muscle from the deep portion of the vastus lateralis was dissolved in 1 N KOH at 75°C for 30 minutes. Dissolved homogenate was neutralised by glacial acetic acid and incubated overnight in acetate buffer (0.3 M sodium acetate, pH to 4.8) containing amyloglucosidase (Boehringer Mannheim, Indianapolis, IN). The reaction mixture was neutralised with 1 N NaOH. Samples were then analysed by measuring glucosyl units by the Trinder reaction (Sigma, St. Louis, MO).

Key secondary outcome(s))
Protein expressions of GLUT4, p-Akt measured with western blotting

Completion date
31/07/2012

Eligibility

Key inclusion criteria
For the successful completion of the proposed study, twelve male athletes, aged around 20 years will be recruited from National Taichung University and National Taiwan College of Physical Education. All subjects have been participated in regular exercise training at least three years.

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Sex
Male

Key exclusion criteria
Subjects who have never been accept regular exercise training and are smokers will be excluded to participate this study.

Date of first enrolment
01/08/2011

Date of final enrolment
31/07/2012

Locations

Countries of recruitment
Taiwan

Study participating centre
140,Min-Sheng Road
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Sponsor information

Organisation
National Science Council (Taiwan)

ROR
https://ror.org/02kv4zf79

Funder(s)

Funder type
Government

Funder Name
National Science Council (Grant number NSC100-2410-H-142-015-)

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not provided at time of registration

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes