

Endurance exercise at high altitude under carbohydrate supplementation

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Insight in the relative and absolute contribution of substrates during exercise contributes to an adequate nutritional strategy advised by sport dietitians for athletes who are acutely exposed to high altitude conditions. An adequate nutritional...

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|------------------------------|---------------------|
| Ethical review | Approved WMO |
| Status | Recruitment stopped |
| Health condition type | Other condition |
| Study type | Interventional |

Summary

ID

NL-OMON36965

Source

ToetsingOnline

Brief title

Nutrition, Sports and Altitude

Condition

- Other condition

Synonym

Not applicable

Health condition

op geen enkele aandoening

Research involving

Human

Sponsors and support

Primary sponsor: Hogeschool van Arnhem en Nijmegen

Source(s) of monetary or material Support: Ministerie van OC&W, Nutrisense Powerbar

Intervention

Keyword: Altitude, Carbohydrates, Nutrition, Performance

Outcome measures

Primary outcome

The primary study outcome of the study for measuring energy expenditure is oxygen consumption

Secondary outcome

The CO₂-production of the subjects is also measured. In combination with the oxygen consumption the Respiratory Quotient ($RQ = CO_2/O_2$) can be determined. Changes in RQ are indicative for changes in substrate use and could indicate a shift from fat to carbohydrate utilization.

Study description

Background summary

Many athletes, especially cyclists like to train at high altitude to achieve training stimuli that cannot be generated at sea level. The energy production of the muscle depends more on anaerobic metabolism during high altitude conditions. This means that the (an)aerobic power of the body can be trained at a lower submaximal training intensity. The necessary shift from aerobic to anaerobic energy production, leads to a selective use of carbohydrates. The nutritional advice for cyclists wanting the best possible performance at high altitude needs to be adjusted to the higher use of carbohydrates. Sport dietitians prefer customized nutritional advice.

Study objective

Insight in the relative and absolute contribution of substrates during exercise

contributes to an adequate nutritional strategy advised by sport dietitians for athletes who are acutely exposed to high altitude conditions. An adequate nutritional strategy can improve physical performance of athletes acutely exposed to high altitude conditions. The increase of oxygen consumption by increasing work load with 25 Watt are indicative for changes in energy production of the muscle.

Study design

Randomised controlled single blind crossover design

Intervention

In this study with high altitude simulation cyclists perform an incremental exercise protocol 3 times (A, B, C). The only difference between the 3 protocols is the simulated altitude (sea level or 2500 m) and following the nutritional guidelines (350 ml isotonic sports drink) for endurance athletes:

Protocol A: Sea level 0 m 21% O₂ - no nutritional intervention

Protocol B: High altitude 2500 m 16% O₂ - no nutritional intervention

Protocol C: High altitude 2500 m 16% O₂ - carbohydrate supplementation

Because the subjects are well trained, the exercise protocol starts at a relative high work load of 100 Watt. The work load will be increased with 25 Watt each 5 minutes to a maximal work load of 300 Watt.

Study burden and risks

Although each of the exercise protocols is designed to end with heavy exertion, the exercise protocol cannot be considered as potentially dangerous or risky for the (semi)-professional riders who participate in this study. The work load during the exercise protocols does not exceed the work load of semi professional cyclists during training. The work load of semi professional cyclists during training is often higher. During the study exercise protocols are stopped by the researcher when the heart rate exceeds 90% of the maximal heart rate (HR_{max}). The HR_{max} is individually determined by the sports physician. During competition such as time trials semi professional cyclists often exceed an exercise intensity 90% HR_{max}.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age

Adults (18-64 years)

Elderly (65 years and older)

Inclusion criteria

Male

18 years or older

Semi professional cyclists

Self reported healthy

Exclusion criteria

Anaemie (Hb < 7.5 mmol/L, Hc < 41%)

Diabetes (fasting plasma glucose > 5.8 mmol/L and/or glucosuria)

Following a weight reduction programme or medically prescribed diet

Weight change > 2 kg during the last 2 months

Medication that may influence energy metabolism, weight or food intake
Gastrointestinal disorders (blood in stool, constipation and/or diarrhoea)
History of medical or surgical events that may affect study outcome
Blood donation in the last month before the study or during the study
Abnormal ECG or impaired lung function

Study design

Design

Study type: Interventional

Masking: Single blinded (masking used)

Control: Uncontrolled

Primary purpose: Other

Recruitment

NL

Recruitment status: Recruitment stopped

Start date (anticipated): 29-11-2012

Enrollment: 20

Type: Actual

Ethics review

Approved WMO

Date: 29-11-2012

Application type: First submission

Review commission: CMO regio Arnhem-Nijmegen (Nijmegen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

| Register | ID |
|----------|----------------|
| CCMO | NL40915.091.12 |