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Does a high-sodium, carbohydrate-free electrolyte drink affect 15-km running performance in trained men in warm and humid conditions?

Submission date
23/09/2026

Recruitment status
No longer recruiting

Registration date
24/09/2026

Overall study status
Completed

Last Edited
24/09/2026

Condition category
Other

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

Plain English summary of protocol
Not provided at time of registration

Contact information

Type(s)
Public, Scientific, Principal investigator

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Additional identifiers

Study information

Scientific Title

Effects of a high-sodium, carbohydrate-free multi-electrolyte supplement versus placebo on 15-km treadmill time-trial performance in trained male runners exercising in warm and humid conditions: a randomized, single-blind, counterbalanced crossover trial

Study objectives
To determine the effects of a high-sodium, carbohydrate-free multi-electrolyte supplement compared with placebo on 15-km treadmill time-trial performance and physiological responses in trained male runners exercising in warm and humid conditions.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 15/01/2026, Grove City College Institutional Review Board (100 Campus Drive, Grove City, 16127, United States of America; +1 (0)724 458 3374; irb@gcc.edu), ref: 128-2025

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Blinded (masking used)

Control
Placebo

Assignment
Crossover

Purpose
Exercise performance

Study type(s)

Health condition(s) or problem(s) studied
Endurance exercise performance and physiological responses during running in warm and humid conditions

Interventions
In a randomized, single-blind, counterbalanced crossover design, participants completed two 15-km treadmill time trials separated by a 7-day washout period. Treatment order was counterbalanced across participants using an alternating sequence.

Thirty minutes before each trial, participants consumed either 500 ml of a high-sodium multi-electrolyte beverage containing 1000 mg sodium, 200 mg potassium, and 60 mg magnesium, or a flavor-matched placebo containing no added electrolytes. During exercise, participants consumed 250 ml of the assigned beverage every 15 min of accumulated running time until completion. Trials were performed at 26.7°C and 60% relative humidity.

Intervention Type
Supplement

Primary outcome(s)
1. 15-km treadmill time-trial completion time measured using a handheld stopwatch at completion of each 15-km time trial

Key secondary outcome(s)

Completion date
14/04/2026

Eligibility

Key inclusion criteria
1. Male
2. 18–50 years of age
3. Running ≥40 km/week
4. Trained for or completed a 10-km run within the previous 3 months
5. 10-km completion time <60 min
6. ≥2 years of distance-running experience
7. VO_2max ≥50 mL·kg^{1}·min^{1}
8. Habitual mixed diet and not following a carbohydrate-restricted or other specialized dietary pattern

Healthy volunteers allowed
Yes

Age group
Adult

Lower age limit
18 Years

Upper age limit
50 Years

Sex
Male

Total final enrolment
10

Key exclusion criteria
1. History of smoking
2. Known metabolic, cardiovascular, or respiratory disease, including diabetes or chronic electrolyte imbalance
3. Orthopedic, neurological, or musculoskeletal condition contraindicating exercise testing; history of exertional heat stroke, recurrent heat exhaustion, or unexplained exertional syncope or heat intolerance

4. History of exercise-associated hyponatremia, syndrome of inappropriate antidiuretic hormone secretion, chronic kidney disease, heart failure, liver failure, or known salt-wasting disorders

Date of first enrolment
12/02/2026

Date of final enrolment
24/03/2026

Locations

Countries of recruitment
United States of America

Sponsor information

Organisation
Grove City College

ROR
https://ror.org/01755xe07

Funder(s)

Funder type

Funder Name
Grove City College

Alternative Name(s)
GCC

Funding Body Type
Private sector organisation

Funding Body Subtype
Universities (academic only)

Location
United States of America

Funder Name
Drink LMNT, Inc.

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not expected to be made available