ISRCTN12401551 https://doi.org/10.1186/ISRCTN12401551

Safety of twenty-eight-day consumption of ΔG® in healthy adults and type 2 diabetes patients

Submission date 28/12/2017	**Recruitment status** No longer recruiting	[X] Prospectively registered [_] Protocol
Registration date 10/01/2018	**Overall study status** Completed	[_] Statistical analysis plan [X] Results
Last Edited 27/02/2023	**Condition category** Other	[_] Individual participant data

Plain English summary of protocol

Current plain English summary as of 26/10/2018:
Background and study aims
Emerging evidence shows that calorie restriction and ketogenic diets (low carbohydrate, high fat) improve insulin resistance, weight loss and glucose metabolism. However, both low calorie and ketogenic diets are poorly tolerated. Recently, it became possible to raise blood ketone levels by providing ketones in a drink (ΔG®) without restricting food intake or carbohydrates. Its consumption for up to five days has been proven to be safe and tolerable. Confirming its consumption for longer periods is safe and well tolerated could translate into a useful new treatment for chronic diseases such as type 2 diabetes and obesity. The aim of this study is to find out whether drinking a ketone ester three times a day for 28 days is safe and well tolerated.

Who can participate?
Healthy volunteers aged 18 - 70 or people with type 2 diabetes aged 18-70. The study is currently only recruiting people with type 2 diabetes and is no longer recruiting healthy volunteers.

What does the study involve?
For healthy volunteers:
Participants drink a 65 ml ketone ester drink three times daily for one month. Participants are asked to keep a dietary log, to take daily glucose and blood ketone pinprick measurements, and to undergo weekly blood tests to assess the safety and tolerability of the ketone ester.

For people with type 2 diabetes:
The study will involve 7 weekly visits either to the Department of Physiology, Anatomy and Genetics (DPAG) or to the Warwickshire Institute for the Study of Diabetes, Endocrinology and Metabolism (WISDEM) over approximately six weeks. Participants will drinking three times daily for 28 days a 65 ml drink containing 25 mg of ΔG® and 120 calories. It has a bitter taste and participants will get to taste it before enrolling. Participants will also be asked to wear a continuous glucose monitor for 6 weeks. There will be a weekly collection of blood samples and a urine dipstick test.

What are the possible benefits and risks of participating?
In previous safety and tolerance studies, the most reported side effects were mild nausea, abdominal distension and headache. Participants might experience moderate weight loss (less than 5% of total body weight).

Where is the study run from?
University of Oxford and the Warwickshire Institute for the Study of Diabetes, Endocrinology and Metabolism (UK)

When is the study starting and how long is it expected to run for?
October 2017 to June 2018

Who is funding the study?
TdeltaS Ltd (UK)

Who is the main contact?
Dr Luis Adrian Soto Mota
adrian.soto@dpag.ox.ac.uk

Previous plain English summary:
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Contact information

Type(s)
Public

Contact name
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Additional identifiers

Protocol serial number
DELTAGHP2018

Study information

Scientific Title
Safety of twenty-eight-day consumption of ΔG® in healthy adults and type 2 diabetes patients: a non-randomised study

Study objectives
Consuming 25 mg of a ketone ester three times a day during 28 days will be safe and well tolerated by healthy adults.

Ethics approval required
Old ethics approval format

Ethics approval(s)
South Central - Oxford B Research Ethics Committee, 07/03/2018, REC ref: 18/SC/0064

Primary study design
Interventional

Study design
Prospective non-randomised open-label single-group study

Study type(s)
Other

Health condition(s) or problem(s) studied
Consumption of a ketone ester

Interventions
Consumption of a drink containing 25 mg of a ketone ester three times a day for 28 days. Participants will be asked to keep a dietary log, to take daily glucose and blood ketone pinprick measurements and to undergo weekly blood tests.

Intervention Type
Supplement

Primary outcome(s)
Measured at baseline and weekly after the start of the intervention until the end of participation:
1. Tolerability, measured with the reported frequency and severity of adverse effects using open questions: "Have you experienced any unpleasant symptoms in the last week?","How frequently?" and all symptoms graded as "mild", "moderate" or "severe"
2. Safety, assessed with blood samples, particularly levels of beta-hydroxybutyrate and pH

Key secondary outcome(s)
Measured at baseline and weekly after the start of the intervention until the end of participation:
1. Weight and body composition measured with electric bioimpedance
2. Insulin sensitivity assessed with the HOMA-IR score

Completion date
30/06/2020

Eligibility

Key inclusion criteria
Current participant inclusion criteria as of 26/10/2018:
This study is currently only recruiting people with type 2 diabetes.

People with type 2 diabetes:
1. Type2 diabetes patients who don’t use or need insulin and who have had the same treatment for the last 6 months. Confirmation of eligibility from your GP will be requested.
2. Fluent in English
3. Males, or females using hormonal birth control if sexually active
4. Aged 18-70

Healthy volunteers (not currently open to recruitment):
1. Participants must be fluent in English, have no communication impairments and should be willing and able to give informed consent for participation in the trial
2. Aged 18 – 70 (inclusive)
3. With no known medical diagnosis

4. Have had no course of medication, whether prescribed or over-the-counter, in the four weeks before the first trial dose and no individual doses in the final two weeks other than over the counter analgesics, vitamins and mineral supplements or, for females, oral contraceptives
5. Female participants of childbearing potential and male participants whose partner is of childbearing potential must be willing to ensure that they or their partner mechanical or pharmacological contraception during the trial and for 3 months thereafter
6. In the Investigator's opinion, is able and willing to comply with all trial requirements
7. Willing to allow his or her General Practitioner and consultant, if appropriate, to be notified of participation in the trial

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Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 Years

Upper age limit
70 Years

Sex
All

Total final enrolment
21

Key exclusion criteria
1. Female participant who is pregnant, lactating or planning pregnancy during the trial
2. Significant renal or hepatic impairment
3. Scheduled elective procedures requiring general anaesthesia during the trial
4. Any other significant disease or disorder which, in the opinion of the investigator, may either

put the participants at risk because of participation in the trial, or may influence the result of the trial, or the participant's ability to participate in the trial
5. Participants who have participated in another research trial involving an investigational product in the past 12 weeks

Date of first enrolment
01/02/2018

Date of final enrolment
30/04/2020

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
University of Oxford
Department of Physiology, Anatomy and Genetics
Sherrington Building
Parks Road
Oxford
United Kingdom
OX1 3PT

Study participating centre
Warwickshire Institute for the Study of Diabetes, Endocrinology and Metabolism
University Hospital
Clifford Bridge Road
Coventry
United Kingdom
CV2 2DX

Sponsor information

Organisation
TdeltaS Ltd

Funder(s)

Funder type
Industry

Funder Name
TdeltaS Ltd

Results and Publications

Individual participant data (IPD) sharing plan
Access will be granted to authorised representatives from the Sponsor, host institution and the regulatory authorities to permit trial-related monitoring, audits and inspections. To request it, contact Professor Kieran Clarke (info@tdeltas.com).

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		20/05/2021	27/02/2023	Yes	No
HRA research summary			28/06/2023	No	No