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IRONWOMAN: the impact of iron deficiency in exercising women

Submission date	Recruitment status	[ ] Prospectively registered
14/09/2016	No longer recruiting	[ ] Protocol
Registration date	**Overall study status**	[ ] Statistical analysis plan
23/09/2016	Completed	[ ] Results
Last Edited	**Condition category**	[ ] Individual participant data
10/08/2017	Haematological Disorders	[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
Iron deficiency anaemia is a health condition where a lack of iron in the body results in a fewer than normal number of red blood cells. Red blood cells help to store and carry oxygen in the blood and if there are fewer than usual then the body may not get as much oxygen as it should. Symptoms of iron deficiency anaemia include feeling very tired, breathlessness, heart palpitations and looking palter than usual. This study looks at the effects of low iron (i.e. iron deficiency anaemia and iron deficiency non-anaemia) and its impact on the performance of women who exercise. Endurance exercise can cause small iron loss through haematuria (blood in urine), gastrointestinal bleeding, sweating and haemolysis (destruction of red blood cells, particularly so for impact sports involving foot strike). Females who participate regularly in endurance training therefore are more likely to have an iron deficiency, particularly so for women on their period (menstruating). Iron is essential for the healthy functioning of the body and deficiency will eventually result in a reduction in energy levels, weakness, impaired cognition (not being able to think so clearly) and motivation amongst other long-term detrimental effects to the human body. The purpose of this study is therefore to see whether intravenous iron supplementation (iron provided though a drip) improves exercise performance and quality of life in iron deficient exercising women.

Who can participate?
Women (aged at least 18) with lower than usual iron levels and exercise at least 90 minutes a week.

What does the study involve?
All participants are asked to have a screening test to begin with. This involves having a blood test to check their iron status to see if they are eligible for this research. During the visit to the lab each participant is given an overview of the study and will be able to ask questions. This takes place at St Mary's University, Twickenham. Once they have been accepted onto the study, the participants do an exercise test called the VO2max test (it measures the maximum amount of oxygen that a person can take in and use while exercising), a blood test, a total haemoglobin mass test (another test that measures fitness that requires the participant to breathe in a tiny amount of carbon monoxide) , provide a urine sample and answer 5 questionnaires. . This takes place at St Mary's University, Twickenham. The participants then go to the iron therapy clinic

located at 112 Harley Street, London to receive an iron injection. This will take 15 minutes and each participant will be monitored for 30 minutes afterwards. Two weeks later, the participants are asked to return to St Mary's University, Twickenham and repeat the tests that were performed at the start (the VO2max test, blood test, total haemoglobin mass test, urine sample and 5 questionnaires. After a further 12 weeks, the participants return to St Mary's again for a blood test and to complete a last set of questionnaires.

What are the possible benefits and risks of participating?
The most common reported side effects of intravenous iron are dizziness, high blood pressure and/or
injection site reactions. Other less common side effects include an allergic reaction, sensation of pain, a change in taste sensation, high heart rate, low blood pressure, redness in the face, difficulty breathing, vomiting, upset stomach, flatulence, abdominal pain, constipation, diarrhoea, itching, hives, redness of the skin, rash, muscle, joint and/or back pain, muscle spasm, fever , tiredness, chest pain, swelling of the hands and/or the feet, pain and/or chills.

Where is the study run from?
St Mary's University, Twickenham and 112 Harley Street, London

When is the study starting and how long is it expected to run for?
September 2015 to August 2018

Who is funding the study?
SCA-Libresse-Bodyform

Who is the main contact?
Miss Georgie Bruinvels

Contact information

Type(s)
Public

Contact name
Miss Georgie Bruinvels

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Additional identifiers

EudraCT/CTIS number

IRAS number

ClinicalTrials.gov number

Secondary identifying numbers
15/LO/1570

Study information

Scientific Title
The effect of iron deficiency on functional performance outcome measures and quality of life in exercising women

Acronym
IRONWOMAN

Study objectives
1. Administration of intravenous iron to iron deficient exercising females will not improve markers of functional performance (including VO2max)
2. Administration of intravenous iron to iron deficient exercising females will not improve quality of life or fatigue
3. No alterations in haemoglobin levels or total haemoglobin mass will be seen when intravenous iron is given to iron deficient exercising females
4. There is no relationship between repletion of iron stores and change in mood state in iron deficient exercising females

Ethics approval required
Old ethics approval format

Ethics approval(s)
London-Westminster Research Ethics Committee, 16/11/2015, ref: 15/LO/1570

Study design
Observational, pre-post case series study

Primary study design
Observational

Secondary study design
Case series

Study setting(s)
Other

Study type(s)
Treatment

Participant information sheet
See additional files

Health condition(s) or problem(s) studied
Iron deficiency

Interventions
Participants identified as likely to meet the study predefined criteria for being iron deficient are invited to undergo some tests and answer some questionnaires before being given a single injection of iron.

The initial tests and completion of questionnaires will then be repeated on one or two occasions. The aim of giving participants the iron is to return their iron levels to a 'clinically normal' level. They are asked to visit St Mary's University, Twickenham on four occasions for a number of tests, and 112 Harley Street, London as explained below:

1. Screening test – this will involve having a blood test to check iron status to check eligibility. Participants are also given a overview of study and opportunity to ask questions. This will take place at St Mary's University, Twickenham.
2. Baseline testing – participants undergo a VO2max test, blood test, a total haemoglobin mass test, are asked to provide a urine sample and answer 5 questionnaires (approx. 2 hours for all tests). This
will take place at St Mary's University, Twickenham.
3. Iron injection - This will be given by a trained medical professional at 12 Harley Street, London. Iron will be infused over a minimum period of 15 minutes. Participants will be given 20 mg/kg of body weight of intravenous iron (iron isomaltoside 1000, Pharmacosmos, UK). All participants will be observed for
for 30 minutes after this. (approx. an hour in total)
4. Follow up testing – 2 weeks after the iron injection, participants are asked to visit St Mary's University, Twickenham and repeat the tests that were performed at baseline. 3 months (12 weeks) after the iron injection participants are asked back for a final visit to St Mary's for a blood test and complete the same 5 questionnaires as before.

Intervention Type
Drug

Phase
Phase I

Drug/device/biological/vaccine name(s)
Iron isomaltoside 1000, Pharmacosmos, UK

Primary outcome measure
Change in VO2max (maximum volume of oxygen) at 2 weeks (+/- 1 week) post-intervention

The VO2max test will consist of two parts, as described below.
1. A discontinuous incremental treadmill test with 3-minute stages at each speed, increasing by 1km.h-1 until lactate increases to around 4mMol.L-1. After each stage, participants will stop for 30s while an earlobe capillary blood sample will be taken for blood lactate analysis using an automated analyser (Biosen C-Line, EFK Diagnostic, Barleben, Germany)
2. Following a 10 minute period of active recovery, participants will complete an incremental maximal test which involves gradient increases of 1% each minute at a constant speed (1-2 km/h slower than reached in part 1). Participants will be encouraged to continue running until they feel they cannot keep going. A capillary blood sample will be collected at the end

Secondary outcome measures
From baseline to 2 weeks (+/- 1 week) post-intervention

1. Change in exercise economy, lactate threshold, lactate turnpoint, time to exhaustion, rate of perceived exertion and vVo2max (velocity at maximal oxygen uptake), measured using an online breath-by-breath analyser
2. Change in haemoglobin levels (blood test)
3. Change in markers of iron status (blood test)
4. Change in FBC parameters (blood test)
5. Change in health-related quality of life or HRQoL, assessed using questionnaires EQ-5D-5L and SQOM
6. Change in thbmass and blood volume (tHbmass test)
7. Change in urinary fractional excretion of phosphate (urine samples)
8. Change in mood (BRUMS Mood Questionnaire)

Overall study start date
01/09/2015

Completion date
31/08/2018

Eligibility

Key inclusion criteria
1. Female
2. At least 18 years of age with signed written informed consent
3. Screening haemoglobin [Hb] ≥ 90 g/L (9.0 g/dL) but ≤ 130 g/L (13.0 g/dL)
4. Screening ferritin > 30ng/ml
5. Laboratory data used for determination of eligibility at the baseline visit must not be older than four weeks
6. Undertake at least 90 minutes of regular exercise a week

Participant type(s)
Other

Age group
Adult

Lower age limit
18 Years

Sex
Female

Target number of participants
35

Key exclusion criteria
Participants who, at the start of treatment, meet any of the following criteria are not eligible for the study:

1. Known history of acquired iron overload, or family history of haemochromatosis or thalassemia or transferrin saturation (TSAT) >50%
2. Known reason for anaemia (e.g. untreated B12 or folate deficiency or haemoglobinopathy)
3. Known hypersensitivity to Monofer iron isomaltoside 1000 or its excipients
4. Severe asthma or severe allergy (requiring hospitalisation within the last 12 months)
5. Pregnancy or lactation
6. Inability to fully comprehend and/or perform study procedures in the investigator's opinion
7. Participant involvement in another investigational medical product trial within the previous 4 weeks, that may impact on the results of this trial
8. Problem preventing or impacting upon exercise test
9. Will be changing training during the course of this research

Date of first enrolment
01/09/2015

Date of final enrolment
31/10/2016

Locations

Countries of recruitment
England

United Kingdom

Study participating centre
St Mary's University
Waldegrave Road
Twickenham
United Kingdom
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Sponsor information

Organisation
St Mary's University

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Sponsor type
University/education

ROR
https://ror.org/0067fqk38

Funder(s)

Funder type
Industry

Funder Name
SCA-Libresse-Bodyform

Funder Name
Pharmacosmos

Results and Publications

Publication and dissemination plan
The plan is to publish the results for this study in a peer reviewed journal, alongside presenting the findings at conferences.

Intention to publish date
31/08/2019

Individual participant data (IPD) sharing plan
For access to the datasets or for any other questions please contact:
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IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet		16/09/2016	05/10/2016	No	Yes
HRA research summary			28/06/2023	No	No