# Investigation into the effects of inflammation on pain response

Submission date	Recruitment status	<ul><li>Prospectively registered</li></ul>
05/02/2019	No longer recruiting	☐ Protocol
Registration date	Overall study status	Statistical analysis plan
08/02/2019	Completed	[X] Results
Last Edited	Condition category	Individual participant data
28/05/2020	Signs and Symptoms	

# Plain English summary of protocol

Background and study aims

LPS is a molecule found in the outer membrane of gram-negative bacteria. By intravenously administering sterilized LPS (i.e. into a vein), a controlled immune response can evoked. By performing a battery of pain tests and sampling blood at certain timepoints, the aim of this study is to validate a model to study new analgesics (painkillers) in early phase clinical research, and find new state-of-the art biomarkers that may help treat inflammatory pain.

Who can participate? Healthy male volunteers aged 18 to 55

What does the study involve?

Participants are randomly allocated to be treated with LPS or a placebo (dummy drug) over 2 days, undergo a series of pain tests and provide blood samples.

What are the possible benefits and risks of participating?

No medical benefit can be expected from this study for the participants. LPS can cause influenzalike symptoms (e.g. chills, headache, eye sensitivity to light, nausea, myalgia and arthralgia), increase in core temperature and pulse rate, and decline in mean arterial pressure. Most symptoms are dose-related and resolve within 2-6 hours. As with any study, rare side effects cannot be excluded beforehand. There have been reports of a decrease in cardiac contractility, but these were temporary and were resolved after 8 to 12 hours. CHDR has extensive experience with the use of LPS and will not use a dose of more than 2 ng/kg, reducing the chance of side effects.

Where is the study run from? Centre for Human Drug Research (Netherlands)

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

Who is funding the study?
Centre for Human Drug Research (Netherlands)

# Contact information

# Type(s)

Scientific

#### Contact name

Mr Hemme Hijma

### Contact details

Zernikedreef 08 Leiden Netherlands 2333 CL

# Additional identifiers

# Clinical Trials Information System (CTIS)

Nil known

# ClinicalTrials.gov (NCT)

Nil known

### Protocol serial number

CHDR1749

# Study information

#### Scientific Title

Extended characterization of human endotoxemia: LPS-induced hyperalgesia and inflammatory responses

# Study objectives

The human endotoxemia model is a suitable to create an effect on pain-related markers (functional assessments of nociceptive pain with PainCart, cell surface markers, soluble markers) and on state-of-the-art inflammatory biomarkers.

# Ethics approval required

Old ethics approval format

# Ethics approval(s)

Stichting Beoordeling Ethiek Biomedisch Onderzoek (Stichting BEBO), Dr. Nassaulaan 10 9401 HK Assen, Tel: +31 (0)592 405871, Email: info@stbebo.nl, 19/04/2018, ref: NL65264.056.18

# Study design

Single-centre observational study with interventional measurements

### Primary study design

Interventional

# Study type(s)

Other

# Health condition(s) or problem(s) studied

Hyperalgesia, pain

### **Interventions**

Randomization: double-blind. Randomization created by study-independent statistician using SAS 9.4 for Windows or newer (SAS Institute Inc., Cary, NC, USA), and in accordance with CHDR's applicable standard operating procedures.

Methodology: Per cohort, 11 of 12 subjects were assigned to the following treatment order: saline administration on study day 2 and LPS administration on study day 3. To one subject, LPS was administered on study day 2 and saline on study day 3. This way, both the investigator and subjects were blinded for treatment allocation.

- 1. Lipopolysaccharide (1 ng/kg in cohort 1 and either 0.5 ng/kg or 2 ng/kg in cohort 2)
- 2. Saline NaCl 0.9%, via intravenous administration)

Pain test battery (electrical pain tasks, pressure pain task, heat pain task, cold pressor pain task) at -1h, 0h, 2h, 4h, 8h, 10h and 24h\* (\*: only on study day 3).

The total duration was a maximum of 80 days.

# Intervention Type

Other

# Primary outcome(s)

- 1. Electrical Stair (pre-cold pressor): Pain Detection Threshold (PDT) (mA), Area Under the VAS pain Curve (AUC) (mA\*mm), and post-test VAS (mm) at -1h, 0h, 2h, 4h, 8h, 10h and 24h\* (\*: only on study day 3)
- 2. Electrical Stair (post-cold pressor): PDT (mA), PTT (mA), AUC (mA\*mm), and post-test VAS (mm) at -1h, 0h, 2h, 4h, 8h, 10h and 24h\* (\*: only on study day 3)
- 3. Conditioned Pain Modulation Response (change from electrical stair pre- and post-cold pressor): PDT (mA), PTT (mA), AUC (mA\*mm) at -1h, 0h, 2h, 4h, 8h, 10h and 24h\* (\*: only on study day 3)
- 4. Pressure Pain: PDT (kPa), AUC (kPa\*mm), and post-test VAS (mm) at -1h, 0h, 2h, 4h, 8h, 10h and 24h\* (\*: only in on study day 3)
- 5. Cold Pressor: PDT (°C), AUC (°C\*mm), and post-test VAS (mm) at -1h, 0h, 2h, 4h, 8h, 10h and 24h\* (\*: only on study day 3)
- 6. Thermal pain: peripheral sensitization on primary and control area Pain Detection Threshold (PDT) (°C) at -1h, 0h, 2h, 4h, 8h, 10h and 24h\* (\*: only on study day 3)
- 7. Short Form McGill Pain Questionnaire (SF-MPQ) scores after each of the above pain tests

# Key secondary outcome(s))

1. Cytokines (including, but not limited to IL-1 $\beta$ , IL-6, IL-8, IL-10, TNF- $\alpha$  and IL-1ra; IL-17), measured with ELISA on study day 2 at 0h, 2h, 4h, 10h. On study day 3 at 0h, 5min, 15min, 30min, 1h, 2h, 3h, 4h, 10h and 24h

- 2. LPS, CRP, LBP, PCT, sTREM-1, presepsin; measured with electrochemiluminescence on study day 3 at 0h, 5min, 15min, 30min, 1h, 2h, 3h, 4h, 6h, 8h, 10h, 24h and at follow-up visit
- 3. Antibody glycosylation patterns measured with Nano-LC-ESI-MS on study day 3 at -1h, 2h, 8h and at follow-up visit
- 4. Molecular inflammatory markers: Bradykinin, Kallikrein, cortisol and Prostaglandin E2, measured on study day 2 at 0h, 2h, 3h, 4h, 8h. On study day 3 at 0h, 2h, 3h, 4h, 8h, 24h
- 5. Activation of complement pathways: classical, alternative and lectin route, measured with WIELISA on study day 3 at 0h, 4h
- 6. Mitochondrial membrane potential (MMP); measured with flow cytometry on study day 2 at -1 h, 3h, 6h. On study day 3 at -1h, 3h, 6h, 24h
- 7. Neutrophil activation markers measured with ELISA on study day 2 at 0h, 3h. On study day 3 at 0h, 3h, 24h and at follow-up visit
- 8. Cytokines (including, but not limited to IL-1 $\beta$ , IL-6, IL-8, IL-10, TNF- $\alpha$  and IL-1ra; IL-17); measured with ELISA see above for timepoints
- 9. LPS, CRP, LBP, PCT, sTREM-1, presepsin: measured with ELISA see above for timepoints

# Completion date

01/10/2018

# **Eligibility**

### Key inclusion criteria

- 1. Healthy male volunteers aged 18 to 55 years, inclusive. Healthy status is defined by absence of evidence of any active or chronic disease following a detailed medical and surgical history, a complete physical examination including vital signs, 12-lead ECG, haematology, blood chemistry, and urinalysis
- 2. Body Mass Index (BMI) in the range of 18 to 28 kg/m2, and a minimum body weight of 50 kg
- 3. Be able to abstain from smoking between the screening visit and the study discharge visit
- 4. No history of alcohol or drug abuse
- 5. No history of trauma with likely damage to the spleen or surgery to spleen
- 6. Free from any clinically significant febrile illness 30 days preceding study day 1
- 7. Non-atopic constitution, including non-asthmatic
- 8. No use of any prescription drugs, including aspirin or other non-steroid anti-inflammatory drugs
- 9. Able to give written informed consent and willing to comply with all study-related procedures

# Participant type(s)

Healthy volunteer

# Healthy volunteers allowed

No

# Age group

Adult

# Lower age limit

18 years

### Sex

Male

### Key exclusion criteria

- 1. History of sepsis, cardiovascular disease, previous syncope or malignancy
- 2. Reported unintended weight loss or gain of at least 5 kg in four weeks at screening
- 3. Haemorrhagic diathesis (easy bruising, epistaxis, gastro-intestinal bleeding)
- 4. First degree family history of premature cardiovascular disease event (if diagnosed before 50 years of age)
- 5. Previous participation in a LPS challenge trial or prior exposure to endotoxin
- 6. Recent antibiotic use, operation or intervention by surgeon/dentist
- 7. Any active inflammatory or infectious disease (e.g. periodontitis)
- 8. Hypertension (defined as systolic blood pressure RR > 160 mmHg or diastolic blood pressure RR > 90 mmHg, repeatedly measured after 5 minutes in resting supine position)
- 9. Hypotension (defined as systolic blood pressure RR < 100 mmHg or diastolic blood pressure RR < 50 mmHg)
- 10. Clinically significant abnormalities on the 12-lead ECG (QRS complex > 120 ms, PR interval > 240 ms, QTcF interval > 470 ms)
- 11. Positive test results for Hepatitis B, Hepatitis C, HIV or any other obvious disease associated with immune deficiency
- 12. Renal insufficiency as defined by plasma creatinine  $\geq$  120  $\mu$ mol/L
- 13. Biochemical diagnosis of diabetes mellitus
- 14. Biochemical diagnosis of hypo- or hyperthyroidism (TSH <0.3 or >4.8 mU/L)
- 15. Any medical condition or abnormal laboratory value that is judged clinically significant by the investigator
- 16. Other medical or psychological conditions which, in the opinion of the investigator, might create undue risk to the subject or interfere with the subject's ability to comply with the protocol
- 17. Donation of blood within 3 months prior to screening or donation of plasma within 14 days prior to screening
- 18. Participation in an investigational drug or device study within 3 months prior to screening or more than 4 times in the past year
- 19. Not having a general practitioner
- 20. Not willing to accept information transfer which concerns participation in the study, or information regarding health, like laboratory results, findings at anamnesis or physical examination and eventual adverse events to and from his general practitioner
- 21. Not willing to give permission to have the general practitioner to be notified upon participation in this study
- 22. Any current, clinically significant, known medical condition in particular any existing conditions that would affect sensitivity to cold (such as atherosclerosis, Raynaud's disease, urticaria, hypothyroidism) or pain (i.e., disease that causes pain, hypesthesia, hyperalgesia, allodynia, paraesthesia, neuropathy)
- 23. Subjects indicating pain tests intolerable at screening or achieving tolerance at >80% of maximum input intensity for any pain test for cold, pressure and electrical tests

Date of first enrolment

08/05/2018

Date of final enrolment 10/09/2018

# Locations

### Countries of recruitment

Netherlands

Study participating centre Centre for Human Drug Research

Zernikedreef 08 Leiden Netherlands 2333 CL

# Sponsor information

### Organisation

Centre for Human Drug Research

#### **ROR**

https://ror.org/044hshx49

# Funder(s)

# Funder type

Research organisation

### **Funder Name**

Centre for Human Drug Research

# **Results and Publications**

# Individual participant data (IPD) sharing plan

Contact: M. Moerland, Principal Investigator and H.J. Hijma, project leader email: clintrials@chdr.nl

Only completely anonymized data can be made available. Specifics regarding datasets and for what purposes will be determined per request, all ethical and legal restrictions apply.

# IPD sharing plan summary

Available on request

### **Study outputs**

Output type

**Details** results

Date created Date added Peer reviewed? Patient-facing?

Results article 01/08/2020 Yes No

Participant information sheet Participant information sheet 11/11/2025 No Yes