

Can common differences in our genes explain why some people are more sensitive to pain than others?

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| Submission date 02/11/2021 | Recruitment status No longer recruiting | <input type="checkbox"/> Prospectively registered <input checked="" type="checkbox"/> Protocol |
| Registration date 25/11/2021 | Overall study status Completed | <input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results |
| Last Edited 14/01/2022 | Condition category Other | <input type="checkbox"/> Individual participant data <input type="checkbox"/> Record updated in last year |

Plain English summary of protocol

Background and study aims

We know that genes influence our sensitivity to pain, but we do not have a full understanding of how this happens - which genes are important and why?

Who can participate?

We are recruiting participants from the Avon Longitudinal Study of Parents and Children (ALSPAC) cohort who have specific, common, changes in a gene heavily implicated in pain sensitivity call Transient Receptor Potential A1 (TRPA1).

What does the study involve?

We will invite participants to take part, based upon their known genetic information i.e. if they have or do not have these common changes in their TRPA1 gene. We will then carefully determine their pain sensitivity using quantitative sensory testing. This includes determining their heat and cold detection thresholds and pain thresholds, their mechanical detection thresholds, and their mechanical (punctate and pressure) pain thresholds. We will then apply 10% cinnamaldehyde, an activator of TRPA1, to their forearm for 20 minutes, measure any changes in blood flow and then repeat the sensory testing.

What are the possible benefits and risks of participating?

There are some risks associated with participating. Some pain will be experienced, though this will be minimized. The stimuli, particularly the cinnamaldehyde, may cause some redness of the skin which will settle on its own. Any sensations evoked by the cinnamaldehyde can be reduced by gently cooling the affected area.

Where is the study run from?

University of Bristol (UK)

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

November 2018 to January 2022

Who is funding the study?

Above and Beyond, the University Hospitals Bristol Charity, via their Neurosciences and Mental Health Legacies Call. Grant reference ABL-2019-20-10.

The UK Medical Research Council and Wellcome (Grant ref: 21765/Z/19/Z) and the University of Bristol provide core support for ALSPAC.

Individual team members are supported by the MRC (MC_UU_00011) and the University of Bristol, Wellcome Trust (202802/Z/16/Z) and Cancer Research UK (CRUK) Integrative Cancer Epidemiology Programme (C18281/A29019).

Who is the main contact?

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Contact information

Type(s)

Scientific

Contact name

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Additional identifiers

EudraCT/CTIS number

Nil known

IRAS number

ClinicalTrials.gov number

Nil known

Secondary identifying numbers

B3236

Study information

Scientific Title

Evaluating the association of TRPA1 gene polymorphisms with pain sensitivity: A protocol for an adaptive recall by genotype study.

Study objectives

Individuals homozygous for common (MAF>1%) SNPs in TRPA1 will have altered acute pain sensitivity as demonstrated by Quantitative Sensory Testing.

Ethics approval required

Old ethics approval format

Ethics approval(s)

Approved 29/10/2019, ALSPAC Ethics and Law Committee (Children of the 90s, Oakfield House, Oakfield Grove, Bristol, BS8 2BN, UK; +44 (0)117 331 0010; alspac-ethics@bristol.ac.uk), ref: 94082

Study design

Single centre adaptive recall by genotype study

Primary study design

Observational

Secondary study design

An adaptive recall by genotype

Study setting(s)

Other

Study type(s)

Other

Participant information sheet

See additional files

Health condition(s) or problem(s) studied

The association of TRPA1 gene polymorphisms with pain sensitivity

Interventions

Five TRPA1 SNPs known to introduce missense mutations and with minor allele frequencies of >1% hypothesized to impact TRPA1 function will be investigated. The effect of these five SNPs will be assessed in three groups due to the high linkage disequilibrium between two pairs of minor alleles. QST results from the individuals in these three test groups will be compared to those of a reference group who are homozygous for the major (ancestral) allele at all five SNPs. The results will be subject to planned interim assessments for futility to alter recruitment if there is low probability of success of detecting a phenotype for a given allele until a maximum of 100 participants have been assessed. Heat pain threshold is the primary outcome.

The SNPs of interest were rs7819749, rs959976 with rs920829, rs16937976 with rs13268757 (dbSNP build 154, GRCh38) and a control group of individuals homozygous for all five major alleles. Investigators and participants will remain blind to genotype throughout the recruitment and data collection phases of the study.

The participants will be assessed using quantitative sensory testing (QST) before and after sensitisation by topical application of 10% cinnamaldehyde (a known activator of TRPA1). QST paradigms are based upon the DFNS protocol, streamlined in line with the primary hypothesis to omit some non-nociceptive assessments.

Intervention Type

Genetic

Primary outcome measure

Measured before and after 20 minute topical application of 10% cinnamaldehyde in ethanol: Heat pain threshold measured using a thermode (Medoc TSA-II, Medoc, Israel, or similar) on the right volar forearm. The temperature of the thermode will change at 1°C per second until the participant reports either detection of temperature change, or detection of pain via a mouse click. The thermode then returns to a neutral temperature of 32°C. The first trial will be discarded as an acclimatisation and then followed by 3 experimental repeats.

Secondary outcome measures

Measured before and after 20 minute topical application of 10% cinnamaldehyde in ethanol:

1. CDT, cold detection threshold measured using the same method as the heat threshold with a cooled thermode
2. WDT, warm detection threshold measured using the same method as the heat threshold
3. CPT, cold pain threshold measured using the same method as the heat threshold with a cooled thermode

4. MDT, mechanical detection threshold

5. MPT, mechanical pain threshold

6. MPS; mechanical pain sensitivity

Thresholds for innocuous mechanical stimuli will be assessed using calibrated von Frey filaments (TouchTest; Stoelting, USA) via the method of levels. Mechanical pain thresholds, again via the method of limits, and stimulus response curves will be assessed using calibrated punctate needle stimulators (PinPricks; MRC Systems, Germany). For the stimulus response curve participant numerical pain ratings from 0 (no pain) to 100 (worst imaginable pain), will be assessed 5 times with 7 filaments exerting forces from 8 to 512mN presented in a randomised manner

7. Brush, presence or absence of brush allodynia measured with 5 standardised brush strokes (SenseLab; via MRC Systems, Germany)

8. Pressure, deep pressure pain threshold measured using an algometer (Somedic, Sweden) applied over the muscles of the right volar forearm

9. Axonal flare in response to cinnamaldehyde will be measured using full-field laser perfusion imaging (FLPI) of the target area of skin (moorFLPI-2; Moor Instruments)

Overall study start date

01/11/2018

Completion date

01/01/2022

Eligibility

Key inclusion criteria

Participants within the Avon Longitudinal Study of Parents and Children (ALSPAC) cohort who are a regionally representative cross-sectional population aged around 30 years (with a correspondingly relatively low incidence of chronic pain).

Participant type(s)

Other

Age group

Adult

Sex

Both

Target number of participants

100

Key exclusion criteria

1. Neurological disorders including peripheral neuropathy
2. Regular use of analgesics
3. Any pain medication taken within 24 hours of QST
4. Pregnancy
5. Acute or Chronic pain conditions
6. Severe anxiety/depression
7. Allergy to cinnamon, mustard, alcohol / chlorhexidine wipes, latex.
8. Use of non-prescribed or recreational drugs (assessed by questionnaire).

Date of first enrolment

27/01/2020

Date of final enrolment

31/12/2021

Locations

Countries of recruitment

England

United Kingdom

Study participating centre

University of Bristol

Oakfield House

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Sponsor information

Organisation

University of Bristol

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Sponsor type

University/education

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ROR

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Funder(s)

Funder type

Charity

Funder Name

Above and Beyond, the University Hospitals Bristol Charity, via their Neurosciences and Mental Health Legacies Call. Grant reference ABL-2019-20-10

Funder Name

University of Bristol

Alternative Name(s)

Universitas Bristolliensis, bristoluniversity, bristoluni

Funding Body Type

Government organisation

Funding Body Subtype

Universities (academic only)

Location

United Kingdom

Funder Name

Medical Research Council

Alternative Name(s)

Medical Research Council (United Kingdom), UK Medical Research Council, MRC

Funding Body Type

Government organisation

Funding Body Subtype

National government

Location

United Kingdom

Funder Name

Wellcome Trust

Alternative Name(s)

Wellcome, WT

Funding Body Type

Private sector organisation

Funding Body Subtype

Trusts, charities, foundations (both public and private)

Location

United Kingdom

Funder Name

Cancer Research UK

Alternative Name(s)

CR_UK, Cancer Research UK - London, CRUK

Funding Body Type

Private sector organisation

Funding Body Subtype

Other non-profit organizations

Location

United Kingdom

Results and Publications

Publication and dissemination plan

The protocol and data will be published in a high impact peer-reviewed journal.

Intention to publish date

01/12/2022

Individual participant data (IPD) sharing plan

The current data sharing plans for this study are unknown and will be available at a later date

IPD sharing plan summary

Data sharing statement to be made available at a later date

Study outputs

| Output type | Details | Date created | Date added | Peer reviewed? | Patient-facing? |
|---|-----------|--------------|------------|----------------|-----------------|
| Participant information sheet | version 6 | 09/09/2019 | 04/11/2021 | No | Yes |
| Protocol (preprint) | | 01/12/2020 | 04/11/2021 | No | No |
| Protocol article | | 12/01/2022 | 14/01/2022 | Yes | No |