

# A pilot study of a new technology for the investigation of high blood pressure in humans

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| <b>Submission date</b><br>16/03/2022   | <b>Recruitment status</b><br>No longer recruiting | <input checked="" type="checkbox"/> Prospectively registered<br><input type="checkbox"/> Protocol            |
| <b>Registration date</b><br>21/03/2022 | <b>Overall study status</b><br>Completed          | <input type="checkbox"/> Statistical analysis plan<br><input type="checkbox"/> Results                       |
| <b>Last Edited</b><br>04/12/2023       | <b>Condition category</b><br>Cancer               | <input type="checkbox"/> Individual participant data<br><input type="checkbox"/> Record updated in last year |

## Plain English summary of protocol

### Background and study aims

The purpose of this research is to generate pilot data to demonstrate how we could use detailed information about rhythms of special group of hormones called catecholamines to tell us more about blood pressure changes in health and disease. High blood pressure (hypertension) is common and often leads to poor health especially if it becomes a long-term condition. Even though it is common, in most people, the cause remains unknown. What we do understand is that, in at least some circumstances, abnormal levels of chemical messengers (hormones) can contribute. We also know that many activities in the body including blood pressure and hormones change across the day, in a rhythmic pattern. However, normally it is very difficult to measure hormone dynamics in detail without a complicated hospital admission. We think that understanding the relationships between rhythms of hormones and blood pressure is important because it will help improve our knowledge of what causes hypertension in the first place. We will use a novel method called U-RHYTHM microdialysis. This allows us to sample hormones very frequently without taking any blood, and allows the person being sampled to continue normal activities, out of hospital, in a more natural setting. As this is a first-of-its kind investigation, we are testing in a small number of people in anticipation of a future, larger trial. We will test healthy people and compare the results with a group of patients with severe hypertension due to a rare disease called pheochromocytoma, which results from catecholamine excess. We will also compare the results from the U-RHYTHM method with 'traditional' tests like blood samples and blood pressure. We believe that the U-RHYTHM method will provide very important new information that could eventually lead to improvements in the diagnosis and treatment of hypertension.

### Who can participate?

Healthy males and females aged over 16, and patients with a diagnosis of secretory pheochromocytoma or paraganglioma

### What does the study involve?

1. A baseline observation period of 7 days in which activity and glucose are monitored automatically by wearable devices
2. Wearing our portable U-RHYTHM sampling device for approximately 24 hours, along with an ambulatory blood pressure monitor, heart rate monitor, and continued glucose and activity

measurements.

3. Providing 1 blood sample and collecting urine in a bottle over the sample 24 hours

4. For patients, being invited to participate again after surgical treatment for their condition

What are the possible benefits and risks of participating?

There are no direct benefits but the data will contribute to new knowledge in the field, and results from the study will be shared with the participants if they wish. Risk is very minimal as previous trials have shown U-RHYTHM sampling to be very safe. There is a small risk that a previously undiagnosed medical condition may be revealed as part of the investigation in which case this will be discussed and referred for further assessment as appropriate.

Where is the study run from?

The main study site in the UK will be Bristol with study visits at facilities shared between the University of Bristol and the Bristol Royal Infirmary. Patients will also be recruited through the Endocrinology Department at Evangelismos Hospital, Athens, Greece.

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

March 2022 to March 2025

Who is funding the study?

The study is funded by a Wellcome Trust Technology Development grant (UK)

Who is the main contact?

Dr Thomas Upton, [thomas.upton@bristol.ac.uk](mailto:thomas.upton@bristol.ac.uk)

## Contact information

### Type(s)

Principal investigator

### Contact name

Dr Thomas Upton

### ORCID ID

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## Additional identifiers

Integrated Research Application System (IRAS)

309240

**Protocol serial number**

WT 223704/Z/21

## Study information

**Scientific Title**

A pilot study of U-RHYTHM technology to validate 24-hour catecholamine measurements

**Study objectives**

1. Test an experimental method (ambulatory microdialysis) to provide an initial characterisation of the 24-hour patterns of catecholamines in interstitial fluid in:
  - a) healthy conditions and
  - b) in conditions of hormone excess (secretory paraganglioma/phaeochromocytoma)
2. Provide an initial assessment of how measurements from conventional diagnostic tests (24-hour ambulatory blood pressure monitoring, urine and plasma catecholamines) compare with the novel ambulatory assessment (tissue metanephrines profiles) and other rhythmic processes linked to catecholamine secretion (glucose patterns, heart rate and heart rate variability).

**Ethics approval required**

Old ethics approval format

**Ethics approval(s)**

Approved 07/09/2022, West Midlands - Edgbaston Research Ethics Committee (3rd Floor Barlow House, Minshull Street, Manchester, M1 3DZ, UK; +44 (0)207 104 8070, +44 (0)207 104 8019, +44 (0)2071048089; edgbaston.rec@hra.nhs.uk); ref: 22/WM/0163

**Study design**

Multi-centre pilot observational trial

**Primary study design**

Observational

**Study type(s)**

Diagnostic

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

Understanding the relationship between blood pressure and catecholamine rhythms in health and in secretory paraganglioma/phaeochromocytoma

**Interventions**

Conventional measurements of catecholamines in single-time point blood and 24-hour urine collections will be compared with 24-hour, 72-sample profiles collected using subcutaneous ambulatory microdialysis. Blood pressure, interstitial glucose, and daily activity will also be captured for context and comparison.

**Intervention Type**

Other

**Primary outcome(s)**

1. Concentrations of catecholamines and their metabolites in samples of microdialysate collected every 20 minutes for 24 hours
2. Concentrations of catecholamines and their metabolites in a venous plasma sample and in a 24 hour urine collection
3. Blood pressure measured using an automated ambulatory blood pressure cuff over 24 hours
4. Heart rate and heart rate variability measured using a portable ECG monitor over 24 hours
5. Peripheral temperature measurements collected every 1 minute using a skin thermometer (iButton) for 24 hours
6. Food intake using a self-reported food diary for 24 hours
7. Sleep and wake patterns and light exposure from a self-reported sleep diary and calculated from wrist actigraphy and light monitoring data for 8 days
8. Blood glucose estimates derived from measurements collected using an interstitial continuous glucose monitor (CGM), sampled every 15 minutes for 8 days

**Key secondary outcome(s)**

Catecholamine features (area under the curve, peak concentrations, peak and nadir times etc) measured as per primary outcome measure 1

**Completion date**

01/03/2025

**Eligibility****Key inclusion criteria**

1. Males and females
2. Age >16 years
3. Clinical and radiological diagnosis of hormone-secreting pheochromocytoma/paraganglioma
4. Healthy volunteers

**Participant type(s)**

Mixed

**Healthy volunteers allowed**

No

**Age group**

Adult

**Lower age limit**

16 years

**Sex**

All

**Key exclusion criteria**

1. Inability to attend study visits due to location
2. Positive urine drug screen (drugs of abuse – cocaine, methamphetamines etc) as these will

- alter catecholamine measurements
3. History of intravenous drug use - any
  4. Current pregnancy, breast feeding

**Patients:**

5. Use of medication known to significantly interfere with measurement of metanephrines within 48 hours of or during the microdialysis sampling period

**Healthy volunteers:**

6. Any active medical condition
7. Any regular prescribed medication
8. Use of any prescribed, over-the-counter, herbal or other medication within or during the 48 hours of microdialysis sampling period, or, at the investigator's discretion,
9. Significant hypertension at screening (SBP >160/DBP >100)
10. Night shift work or international travel (more than 2 time zones) within the previous 60 days
11. Regular intake of alcohol well in excess of recommended weekly consumption

**Date of first enrolment**

01/11/2022

**Date of final enrolment**

01/06/2024

## **Locations**

**Countries of recruitment**

United Kingdom

England

Greece

**Study participating centre**

**University of Bristol**

Senate House

Tyndall Avenue

Bristol

United Kingdom

BS8 1TH

**Study participating centre**

**Evangelismos Hospital**

Endocrinology Department

AHEPA Building

45-47 Ipsilantou Str

Athens  
Greece  
10676

**Study participating centre**  
**Southmead Hospital**  
Southmead Road  
Westbury-on-Trym  
Bristol  
United Kingdom  
BS10 5NB

## Sponsor information

**Organisation**  
University of Bristol

**ROR**  
<https://ror.org/0524sp257>

## Funder(s)

**Funder type**  
Charity

**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

# Results and Publications

## Individual participant data (IPD) sharing plan

The dataset will have exclusive use by the PI and study team from the start of the study, and anonymised data will be made available at the time of publication of research outputs, estimated to be within 1 year of completion of the study.

Anonymised outputs (including the removal of all direct identifiers) will be published in the University of Bristol Research Data Repository in a form suitable for long-term retention and will be available on an open data basis. The Data Repository is managed by the University of Bristol Research Data Service (<http://www.bristol.ac.uk/staff/researchers/data/>).

Pseudo-anonymised data, as defined by the General Data Protection Regulations (2018) Recital 26, will be shared in open access journals and publications and made available on University open access repositories. Primary research databases will be recorded on the University of Bristol’s research information service (PURE) which includes an online portal to search data (data.bris data catalogue). The deposit will be assigned a unique DOI and appear in the DataCite registry. Published research outputs will be stored in the University’s secure Research Data Storage Facility (RDSF) with information made available for both the DOI, and data access via data.bris.

## IPD sharing plan summary

Stored in publicly available repository, Published as a supplement to the results publication

## Study outputs

| Output type                          | Details       | Date created | Date added | Peer reviewed? | Patient-facing? |
|--------------------------------------|---------------|--------------|------------|----------------|-----------------|
| <a href="#">HRA research summary</a> |               |              | 28/06/2023 | No             | No              |
| <a href="#">Study website</a>        | Study website | 11/11/2025   | 11/11/2025 | No             | Yes             |