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Salt: blood pressure elevation, alternative assessments and taste sensitivity

Submission date 19/02/2026	**Recruitment status** Recruiting	[X] Prospectively registered [_] Protocol
Registration date 14/07/2026	**Overall study status** Ongoing	[_] Statistical analysis plan [_] Results
Last Edited 28/10/2026	**Condition category** Circulatory System	[_] Individual participant data [X] Record updated in last year

Plain English summary of protocol

Background and study aims

High blood pressure is a leading cause of death worldwide, and for many people, the primary culprit is salt. About half of the population has a "salt-sensitive" body type, meaning their blood pressure spikes dangerously after eating salty foods, significantly increasing their risk of heart disease. Unfortunately, the current way to test for this sensitivity is an intensive three-week process involving strict diets and 24-hour monitoring, making it nearly impossible for doctors to use in everyday practice.

This study aims to assess a much faster, safer alternative: a simple two-hour test (IPROS). By measuring how blood pressure reacts to a single small dose of salt during a single office visit, we hope to provide a practical tool that helps doctors identify high-risk patients and provide preventative dietary advice.

Who can participate?

All adults aged 21–50 years, residing in Europe for more than one year, who have a smartphone. Participants cannot participate if they have hypertension or other conditions known to influence blood pressure (e.g. advanced chronic kidney disease, heart failure, secondary hypertension), are taking any blood pressure lowering medication, are pregnant or lactating, smoke or have smoked in the past year, and participants cannot have a resting blood pressure of more than 130 /80 mmHg nor a difference between arms of 10 mmHg (these will be testing during the study visit).

What does the study involve?

The study begins with a registration process where participants complete an online demographic and screening questionnaire to determine their eligibility. Once informed consent is provided, participants start the first study session, which can be completed either online via a video conferencing platform or in person, based on their preference. During this initial meeting, participants will complete two questionnaires, are introduced to a dietary recording app, which they will then use to maintain a food diary for seven consecutive days and will calibrate the continuous blood pressure monitoring study device.

Following the initial week of recording, participants attend an onsite visit at the research centre. During this session, the research team performs body composition analysis, a blood lipid test, a taste assessment, and collects a DNA sample. This visit also includes a measurement of the body'

s response to salt consumption, known as an IPROS assessment.
After the baseline visit, participants are assigned to one of two groups to begin a crossover dietary intervention. This phase involves following a specific diet for 1 week, followed by a 1-week break, and then switching to the alternative diet for the final week. At the conclusion of each dietary intervention week, participants are required to provide a urine sample. Throughout the diet weeks participants are required to record their diet and throughout the entire duration of the study, participants wear a validated blood pressure monitor.

What are the possible benefits and risks of participating?
There are no direct medical benefits to taking part in this study. However, participants will receive a comprehensive assessment of their blood pressure profile and how their body reacts to salt, which may provide valuable personal health insights. Furthermore, the research offers substantial contributions to science and society by evaluating the Immediate Pressor Response to Oral Salt. This project aims to establish a safer, more practical diagnostic tool to replace current methods, which are often logistically difficult and carry higher safety risks.
The study involves a controlled nutritional salt intervention to establish the necessary data. This process may lead to a temporary increase in blood pressure; however, in a healthy population with normal blood pressure, this risk is considered minimal and reversible. Participants may experience minor discomforts such as increased thirst or mild fluid retention. Additionally, there is a possibility that the study could reveal previously undiagnosed pre-hypertension or hypertension. While the study itself does not provide an official medical diagnosis, researchers will advise any participant whose results suggest these conditions to follow up with a medical professional for formal confirmation and guidance.

Where is the study run from?
1. Precision Nutrition, Lake Lucerne Institute (LLUI), Rubistrasse 9, 6354 Vitznau, Switzerland
2. Nutrition Department, St Mary's University, Twickenham, London, UK.
3. Department of Medicine, Surgery and Health Sciences, University of Trieste, Trieste 34149, Italy and Institute for Maternal and Child Health—IRCCS, Burlo, Garofolo, Trieste 34127, Italy.

When is the study starting and how long is it expected to run for?
The study begins in April 2026 and will run for approximately 2 years.

Who is funding the study?
Lake Lucerne Institute (LLUI)

Who is the main contact?
Dr Catherine A-M Graham, cat.graham@llui.org

Contact information

Type(s)
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Study information

Scientific Title
Can the immediate pressor response to oral salt be used as an alternative method to assess salt sensitive blood pressure, alongside other known blood pressure related clinical assessments?

Acronym
SALT-BEATS

Study objectives
Aim:
This project aims to develop a clinically feasible diagnostic tool for salt-sensitive blood pressure (SSBP).

Primary Objective:
1. To determine how well the immediate pressor response to oral salt (IPROS) discriminates salt-sensitive from non–salt-sensitive individuals, as defined by the reference methodology. This objective is implemented to improve the ability to include SSBP stratification in future research due to the traditional method of diagnosis limiting clinical feasibility and patient safety, while current alternatives lack diagnostic validity.

Secondary Objectives:
1. To assess the association of IPROS with short-term blood pressure-related risk factors of CVD,

for example, nocturnal dipping, morning surge, etc.
2. To assess the association of IPROS with taste sensitivity (including threshold and preference).

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 17/06/2026, Ethikkommision Nordwest und Zentralschweiz (Hebelstrasse 53, Basel, 4056, Switzerland; +41 (0)61 268 13 50; eknz@bs.ch), ref: 2026-00310

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Open (masking not used)

Control
Dose comparison

Assignment
Crossover

Purpose
Prevention, Screening

Study type(s)

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

Interventions
Simple randomisation using SPSS Software to either:

Index test: immediate pressor response to oral salt (IPROS):
After an 8-hour overnight fast, IPROS data will be collected. Briefly, blood pressure (BP) will be recorded at 10-minute intervals for 40minutes. The recording at minute 40 will be used as the baseline rested value. Then, participants will be administered two 1 g sodium chloride tablets, each containing 1 g (394mg of sodium). BP will be monitored at 10-minute intervals for 120 minutes. The protocol and dosage (2 g salt) is supported elsewhere. BP measurements will be made with an automated validated sphygmomanometer in the seated position, with the participants' arms at heart level.

Reference standard: salt loading protocol:
All participants will undertake a 7-day high salt diet (18 g/day) and then a 7-day low salt diet (3 g /day), with a minimum 7-day washout period between.

The diet record undertaken prior to the intervention will be analysed by a researcher. The participant will then be trained on how to reduce the salt content of their diet to <3 g/day. They

will be provided with personalised feedback on their standard dietary intake and with standardised information sheets. During the high-salt diet, participants will be supplemented with salt tablets. BP will be monitored throughout by a validated wristband, which has the CE mark as a Class IIa medical device in accordance with the Medical Devices Regulation (EU) 2017/745. SSBP will be diagnosed when participants exhibit a mean arterial pressure (MAP) difference of ≥5 mmHg between the low and high salt diet weeks. This cut-off is deemed a clinically relevant change.

Intervention Type
Other

Primary outcome(s)
1. Area under the receiver operating characteristic curve (AUROC) value of IPROS compared to the reference methodology measured using the salt sensitivity classifications (mean arterial pressure change or percentage change between diets) at 255 participants completing the entire protocol

Key secondary outcome(s)
1. The influence of salt taste profile on salt taste sensitivity measured using recognition and detection threshold and liking and intensity, at 255 participants completing the IPROS protocol and after the entire study protocol

2. The association of IPROS with short-term blood pressure-related risk factors of cardiovascular disease (CVD) measured using mean arterial pressure and blood pressure at 55 participants completing the IPROS protocol and after the entire study protocol

3. The association of IPROS and salt sensitivity with genetic variations measured using genetic analysis at 255 participants completing the IPROS protocol and after the entire study protocol

Completion date
01/04/2028

Eligibility

Key inclusion criteria
1. Aged 21–50 years, the cut off at age 50 years is related to the association of increased age with salt sensitivity and arterial wall thickening.
2. Participants must have been residing in Europe for more than one year. This cutoff is selected to account for the acculturation effect.
3. Both male and female participants will be recruited, sex will be used as a covariate in all following analysis. Sex is known to influence blood pressure, but difference in the prevalence of salt sensitive blood pressure are unknown. Although sex comparison is not an aim of this study, sex differences will be taken into consideration.
4. All participants are required to be able to give informed consent as documented by signature.
5. Participants in Switzerland must be able to understand English, German or Italian, participants in the UK must be able to understand English, and participants in Italy must be able to understand English or Italian.

Healthy volunteers allowed
Yes

Age group
Adult

Lower age limit
21 Years

Upper age limit
50 Years

Sex
All

Total final enrolment
0

Key exclusion criteria
1. Pregnant or lactating
2. Diagnosed hypertension or other conditions known to influence blood pressure (e.g. advanced chronic kidney disease, heart failure, secondary hypertension).
3. Participants must not be taking any blood pressure regulating medication. Blood pressure medication will impact response to dietary salt.
4. Participants must not have a resting blood pressure of higher than 130/80 mmHg.

Date of first enrolment
19/08/2026

Date of final enrolment
01/03/2028

Locations

Countries of recruitment
United Kingdom

England

Italy

Switzerland

Study participating centre
St Mary's University, Twickenham
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Sponsor information

Organisation
Lake Lucerne Institute (LLUI)

Funder(s)

Funder type

Funder Name
Lake Lucerne Institute (LLUI)

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary

Not expected to be made available