ISRCTN81020233 https://doi.org/10.1186/ISRCTN81020233

# Harnessing exhaled breath for lung cancer early detection

| Submission date | Recruitment status | [_] Prospectively registered |
|---|---|---|
| 29/02/2024 | No longer recruiting | [_] Protocol |
| **Registration date** | **Overall study status** | [_] Statistical analysis plan |
| 21/05/2024 | Ongoing | [X] Results |
| **Last Edited** | **Condition category** | [_] Individual participant data |
| 10/04/2026 | Cancer | |

## Plain English summary of protocol

Background and study aims
Lung cancer causes more deaths than any other cancer due to diagnosis after it has spread. If diagnosed early, before spread, then curative treatment can be offered. Screening programs using CT scans can diagnose lung cancer early and save lives, but they are expensive and can only be applied to people at the very highest risk, which represents less than 40% of people with lung cancer.
Exhalation technology have a device (Inflammacheck) that detects hydrogen peroxide in exhaled breath, which has previously been suggested to be raised in the breath of people who have lung cancer. This is a pilot study that will test whether the inflammacheck device can distinguish lung cancer cases from controls.

Who can participate?
People aged 18 years and over participating in lung health checks or who have been diagnosed with lung cancer but have not started treatment yet.

What does the study involve?
Breathing into two devices (3 minutes each) at a single visit. Briefly, the researchers will recruit 20 people with lung cancer and 20 non-cancer controls who will breathe into the Inflammacheck device where hydrogen peroxide will be measured. They will screen other exhaled compounds to determine if any other biomarkers emerge that are associated with lung cancer and can increase the performance of Inflammacheck.

What are the possible benefits and risks of participating?
There is no direct personal benefit from taking part - this is not a validated test yet so results will not inform treatment decisions. However, participating will help to develop this test so that people in the future may benefit. Risks include minor discomfort from wearing a nose clip and breathing into the device.

Where is the study run from?
Northern Care Alliance Foundation Trust (UK)

When is the study starting and how long is it expected to run for?
June 2023 to December 2026

Who is funding the study?
The Wellcome Trust (UK)

Who is the main contact?
Dr Sean Knight, sean.knight@nca.nhs.uk

# Contact information

### Type(s)
Public, Scientific, Principal investigator

### Contact name
Dr Sean Knight

### ORCID ID
https://orcid.org/0000-0003-4773-6843

### Contact details
2nd floor CTF Building
University of Manchester
Manchester
United Kingdom
M13 9WU
+44 (0)7817775283
sean.knight@nca.nhs.uk

# Additional identifiers

### Integrated Research Application System (IRAS)
336691

### Central Portfolio Management System (CPMS)
60370

# Study information

### Scientific Title
Harnessing exhaled hydrogen peroxide for early lung cancer detection

### Acronym
ExPeL

### Study objectives
Lung cancer causes an increase in hydrogen peroxide in exhaled breath.

### Ethics approval required

Old ethics approval format

## Ethics approval(s)
Approved 12/02/2024, West Midlands Black Country Research Ethics Committee (2 Redman Place, Stratford, London, E20 1JQ, UK; +44 (0)207 104 8010, +44 (0)207 104 8210, +44 (0)207 104 8290; blackcountry.rec@hra.nhs.uk), ref: 24/WM/0028

## Primary study design
Observational

## Study design
Observational; Design type: Case-controlled study

## Study type(s)
Treatment

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

## Interventions
This is a pilot study assessing whether Inflammacheck can distinguish patients with lung cancer from non-cancer controls. Participants will be identified from outpatient clinics and lung health checks.

This is a case-control study:
Cases: Lung cancer - included if diagnosed with lung cancer, including patients with early-stage (n = 10) and late-stage (n = 10) disease. Patients will be excluded if they have received any lung cancer treatment, have a concurrent alternative active cancer or lack the capacity to consent
Controls: Included if smoking history of more than 20 pack years. Excluded if concurrent active cancer from another organ system or less than 2 years since curative treatment for cancer or lack of capacity to consent (n = 20).

Numbers of participants are the feasibility limit for this study. Participants will be recruited from outpatient clinics and lung health checks. Patients will be approached on the day of their appointment. The research delivery team will describe the study and give a Patient Information Leaflet. After the patient has had time to consider the study and ask any questions, they will provide written consent. This may be on the day of their hospital appointment or at a later date. If consented on the day of appointment, the participant will be asked to breathe into two Inflammacheck devices. If consented after appointment, a research visit will be planned (at the participant's convenience) where they will be asked to breathe into two Inflammacheck devices

For each participant:
The first Inflammacheck device will return a point-of-care result advising of the level of exhaled hydrogen peroxide The second Inflammacheck device will only collect breath condensate (no point-of-care measurements), which will be stored in a freezer and transferred to researchers at the University of Manchester in batches. They will be analysed by a number of unbiased screening methods including mass spectrometry.
The research delivery team will record the name, hospital number and date of birth linked to a unique study number in a password-controlled file ('Identifier file') stored behind the NHS firewall. They will collect health information including age, gender, smoking history, co-morbidities, pathology and imaging results in a separate file ('Clinical information file'), using the

unique study number only as the identifier. The Clinical Information file will be sent to researchers at the University of Manchester (pseudonymised information). At the end of the study the Identifier file will be destroyed thereby fully anonymising the data.

Once participants have provided two Inflammacheck tests, their participation in the study will end.

### Intervention Type
Other

### Primary outcome(s)
Exhaled hydrogen peroxide is measured using the Inflammacheck at the time of recruitment

### Key secondary outcome(s)
Exhaled breath condensate collected at recruitment will be analysed by mass spectrometry

### Completion date
31/12/2026

## Eligibility

### Key inclusion criteria
Cases:
1. Confirmed diagnosis of lung cancer or highly suggestive radiological findings
2. Aged 18 years or older

Controls:
1. Aged 18 years or over
2. More than 20 pack year history of smoking
3. CT scan negative for lung cancer within the last 2 years

### Participant type(s)
Healthy volunteer, Patient

### Healthy volunteers allowed
No

### Age group
Mixed

### Lower age limit
18 Years

### Upper age limit
110 Years

### Sex
All

### Total final enrolment

34

### Key exclusion criteria
1. Concurrent active non-lung malignancy
2. Curative treatment for a non-lung malignancy less than 2 years previously
3. Treatment for lung cancer
4. Acute infection
5. No capacity to consent

### Date of first enrolment
01/04/2024

### Date of final enrolment
31/01/2025

## Locations

### Countries of recruitment
United Kingdom

England

### Study participating centre
### Salford Care Organisation
Stott Lane
Salford
England
M6 8HD

## Sponsor information

### Organisation
Northern Care Alliance NHS Foundation Trust

### ROR
https://ror.org/01nqeyn25

## Funder(s)

### Funder type
Research organisation

**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 datasets generated and/or analysed during the current study will be published as a supplement to the results publication

**IPD sharing plan summary**
Published as a supplement to the results publication

**Study outputs**

| Output type | Details | Date created | Date added | Peer reviewed? | Patient-facing? |
|---|---|---|---|---|---|
| Abstract results | | 02/11/2025 | 10/04/2026 | No | No |
| Preprint results | | 20/03/2026 | 10/04/2026 | No | No |