

# Exploring energy patterns in brain tumours with new imaging technologies (LIFE-GlioB)

<b>Submission date</b> 14/11/2023	<b>Recruitment status</b> Recruiting	<input type="checkbox"/> Prospectively registered <input checked="" type="checkbox"/> Protocol
<b>Registration date</b> 16/11/2023	<b>Overall study status</b> Ongoing	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
<b>Last Edited</b> 12/12/2024	<b>Condition category</b> Cancer	<input type="checkbox"/> Individual participant data <input checked="" type="checkbox"/> Record updated in last year

## Plain English summary of protocol

### Background and study aims

Magnetic Resonance Imaging (MRI) is an important tool for identifying, diagnosing, and tracking various diseases within the body. Often, we use special molecules known as probes to improve the quality of the MRI images produced.

Our current study focuses on exploring new probes to advance imaging specifically for the diagnosis and monitoring of cancer in individuals with brain tumors. Our goal is to refine the clarity of brain images and extract more clinical information from them. Cancer utilizes energy differently than normal tissue. We are investigating whether administering these probes and observing their interaction with cancerous tissue can enable us to recognize these differences. We also aim to understand how cancer evolves during standard treatments and whether these changes can be effectively monitored using these advanced techniques.

We are testing two types of probes: <sup>13</sup>C-pyruvate, administered through injection into a vein, and deuterated glucose, consumed in the form of a sweet drink. Both probes have been deemed safe for study participants.

### Who can participate?

Patients aged 18 years or older, with brain cancers.

### What does the study involve?

MRI scans will take place before and after participant's standard-of-care treatment (e.g surgery or radiotherapy).

MRI scans, lasting about two hours, involve a standard scan and a special hyperpolarized MRI scan, which includes an injection while inside the scanner, or another special scan called deuterated metabolic imaging (DMI), which involves consumption of a sweet drink before a scan.

You might be offered an optional scan within five days to test the technique's repeatability. Other procedures may include basic health checks, blood tests, and pregnancy tests, conducted with your well-being in mind.

Fasting for up to six hours before a scan may be required.

What are the possible benefits and risks of participating?

Taking part in this study may not directly help you, but it could help doctors find better ways to check for and keep track of brain tumours without using invasive methods. You will not be paid for taking part, we can cover your travel and parking costs.

#### Potential risks

**MRI Scans:** MRI scans are safe and do not involve X-rays or radioactivity. Some people might feel a bit closed-in (claustrophobic) or bothered by the noise, but you will be given earplugs and a squeeze-ball to help you feel more comfortable. The imaging software and hardware used are for research and not yet approved for routine diagnosis.

**Incidental Findings:** Although the scans are not part of your medical record, if we notice anything unusual, we will consult a specialist who may need to discuss it with you and your doctor.

**Cannulation (inserting a small tube into a vein):** This is a common procedure and is generally safe, but it might cause some discomfort or bruising at the insertion site. The cannula will be removed immediately after the scan.

**Injection containing a substance called pyruvate:** The injection is generally safe, with only mild and short-lasting side effects like flushing, feeling hot, dizziness or a metallic taste. Allergic reactions are highly unlikely, but we are prepared to manage any issues that may arise.

**Sweet drink containing a substance called deuterated glucose:** Glucose is a natural sugar that our body uses for energy, and deuterium is a safe form of hydrogen that is also found naturally in small amounts in our body. Scientists have previously studied water and glucose containing deuterium in people, and they did not find safety concerns. Any potential side effects will be managed by our team.

Where is the study run from?

Cambridge University Hospitals NHS Foundation Trust (UK).

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

January 2021 to March 2026

Who is funding the study?

Lundbeck Foundation (Denmark)

Who is the main contact?

cu.h.radiologyresearch@nhs.net

<https://www.cancerresearchuk.org/about-cancer/find-a-clinical-trial/a-study-looking-at-3-different-ways-of-doing-an-mri-scan-for-brain-tumours-life-gliob#undefined>

## Contact information

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Public, Scientific

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## **Additional identifiers**

**EudraCT/CTIS number**

Nil known

**IRAS number**

294968

**ClinicalTrials.gov number**

Nil known

## Secondary identifying numbers

IRAS 294968

# Study information

## Scientific Title

Metabolic flux profiling of brain tumours by the new MR-hyperpolarisation technology

## Acronym

LIFE-GlioB

## Study objectives

1.  $^{13}\text{C}$ -pyruvate metabolism can be imaged in patients with brain tumours using hyperpolarised  $^{13}\text{C}$  MRI
2. Standard of care therapy changes  $^{13}\text{C}$ -pyruvate metabolism and this can be used to predict treatment response
3.  $^2\text{H}$ -labelled glucose can be used to probe formation of lactate and glutamine/glutamate in patients with brain tumours
4. Standard of care therapy changes  $^2\text{H}$ -glucose metabolism

## Ethics approval required

Ethics approval required

## Ethics approval(s)

Approved 01/07/2021, South Central - Oxford B Research Ethics Committee (Whitefriars, Level 3, Block B, Lewin's Mead, Bristol, BS1 2NT, United Kingdom; +44 207 104 8028; oxfordb.rec@hra.nhs.uk), ref: 21/SC/0160

## Study design

Observational physiological imaging study

## Primary study design

Observational

## Secondary study design

Cross sectional study

## Study setting(s)

Hospital, University/medical school/dental school

## Study type(s)

Diagnostic

## Participant information sheet

See outputs table

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

Glioblastoma (glioblastoma multiforme and grade IV astrocytoma)

## Interventions

There are two substudies:

1. Using dynamic <sup>13</sup>C-MRI and MRSI in up to 11 brain tumour patients and
2. Using dynamic deuterium metabolic MRI and MRSI imaging (DMI) in up to 11 brain tumour patients

Where possible, we would aim to co-consent the same patient to both substudies which will involve performing both MRI scans at the same imaging visit, however, these may not be possible in some instances and therefore, patients will be recruited to one of the substudies and not the other.

If the patient is selected for surgery, they will be offered an optional MRI scan before their surgery and also an optional research biopsy sample taken at their surgery. If the patient is not selected for surgery or those that have had surgery go on to receive radiotherapy, they will be offered an MRI scan before commencement of radiotherapy and within ten weeks of starting radiotherapy. In order to be classed as evaluable, the patient will need to complete the before commencement of radiotherapy scan AND the scan within ten weeks following commencement of radiotherapy. If the patient does not complete both scans (either due to patient withdrawal or researcher decided withdrawal), they will be replaced by another patient.

This study will not change the treatment that has been determined for the patients either as part of their standard of care or another study.

Patients will not receive more than four injections of <sup>13</sup>C-pyruvate and will not receive more than four deuterated glucose drinks.

## **Intervention Type**

Other

## **Primary outcome measure**

Using MRI imaging:

1. <sup>13</sup>C. Spatial maps of area under the curve (AUC) timecourse sums of signals from hyperpolarized pyruvate, lactate, and any other metabolites detected, and ratios between these metabolite AUCs. Also estimates of the kinetic rate constants of conversion between injected tracer pyruvate and the metabolites formed (lactate, other). The timecourse typically covers approximately 1 minute beginning approximately 16 seconds after the start of injection.
2. DMI. Spectral peak intensity ratios between deuterated water, glucose, glutamate (brain only), lactate and lipids. These will be either in spatial maps derived from 3D spectroscopic imaging, or in unlocalized spectra from the whole sensitive volume of the coil.

## **Secondary outcome measures**

1. Tumour response evaluations based on RECIST within ten weeks of starting radiotherapy
2. Tissue expression (archival or fresh tissue) of metabolic and other markers (such as LDH) measured using RT PCR at the time of standard-of-care surgery.

## **Overall study start date**

10/01/2021

## **Completion date**

31/03/2026

# **Eligibility**

## **Key inclusion criteria**

1. Over 18 years old
2. Able to and provide written informed consent to participate
3. If female, postmenopausal or if women of childbearing potential (WOCBP) using a suitable contraception
4. If male, using a suitable contraceptive method for the duration of the study

**Participant type(s)**

Patient

**Age group**

Adult

**Lower age limit**

18 Years

**Sex**

Both

**Target number of participants**

22

**Key exclusion criteria**

1. Contraindication or inability to tolerate MRI
2. Pregnant or actively breast-feeding woman
3. If using an intrauterine contraceptive device (IUCD) as a method of contraception the device should be MRI safe at 3 T (researcher to confirm)
4. High blood glucose level (as determined by the researcher) that may have an impact on the study results
5. Significant medical or psychiatric history rendering the subject ineligible as deemed by the investigators

**Date of first enrolment**

20/01/2023

**Date of final enrolment**

16/12/2025

**Locations****Countries of recruitment**

England

United Kingdom

**Study participating centre**

Cambridge University Hospitals NHS Foundation Trust  
Cambridge Biomedical Campus  
Hills Road

Cambridge  
United Kingdom  
CB2 0QQ

## Sponsor information

### Organisation

Cambridge University Hospitals NHS Foundation Trust

### Sponsor details

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### Sponsor type

Hospital/treatment centre

### Website

<http://www.cuh.org.uk/>

### ROR

<https://ror.org/04v54gj93>

## Funder(s)

### Funder type

Charity

### Funder Name

Lundbeck Foundation

### Alternative Name(s)

Lundbeckfonden

### Funding Body Type

Private sector organisation

## Funding Body Subtype

Other non-profit organizations

## Location

Denmark

# Results and Publications

## Publication and dissemination plan

Audiences for this research:

1. Scientific community
2. Funders, sponsors including NHS, ethics committees
3. Patients and the public

Dissemination activities will include:

1. Abstracts, posters and talks for national and international scientific conferences
2. PPI events
3. Use of electronic media such as websites and specialised social networks such as LinkedIn and ResearchGate
4. Publications including Full, Executive Summary and Plain English Summary reports of the research, peer review journals and local NHS/University of Cambridge newsletters. Whenever possible, open access to publications will be sought.

This study may form part of a PhD thesis for a PhD student working in the research team.

## Intention to publish date

01/06/2027

## Individual participant data (IPD) sharing plan

Data requests can be submitted starting 9 months after article publication and the data will be made accessible for up to 24 months. Extensions will be considered on a case-by-case basis. Access to trial IPD can be requested by qualified researchers engaging in independent scientific research and will be provided following review and approval of a research proposal and Statistical Analysis Plan (SAP) and execution of a Data Sharing Agreement (DSA). For more information or to submit a request, please contact [cuh.radiologyresearch@nhs.net](mailto:cuh.radiologyresearch@nhs.net).

## IPD sharing plan summary

Available on request

## Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">Participant information sheet</a>	13C substudy version 2.0	28/09/2022	16/11/2023	No	Yes
<a href="#">Participant information sheet</a>	DMI substudy version 2.0	28/09/2022	16/11/2023	No	Yes
<a href="#">Protocol file</a>	version 2.0	28/09/2022	16/11/2023	No	No