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

Submission date 14/11/2023	**Recruitment status** Recruiting	[_] Prospectively registered [X] Protocol
Registration date 16/11/2023	**Overall study status** Ongoing	[_] Statistical analysis plan [_] Results
Last Edited 12/12/2024	**Condition category** Cancer	[_] Individual participant data [X] 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 molecues 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: 13C-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 imageing (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?
cuh.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

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Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

Integrated Research Application System (IRAS)
294968

ClinicalTrials.gov (NCT)
Nil known

Protocol serial number
IRAS 294968

Study information

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

Acronym
LIFE-GlioB

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

Ethics approval required
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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

Study type(s)
Diagnostic

Health condition(s) or problem(s) studied
Glioblastoma (glioblastoma multiforme and grade IV astrocytoma)

Interventions
There are two substudies:
1. Using dynamic 13C-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 to 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 13C-pyruvate and will not receive more than four deuterated glucose drinks.

Intervention Type
Other

Primary outcome(s)
Using MRI imaging:
1. 13C. 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.

Key secondary outcome(s))
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.

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

Healthy volunteers allowed
No

Age group

Adult

Lower age limit
18 years

Sex
All

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
United Kingdom

England

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

ROR

https://ror.org/04v54gj93

Funder(s)

Funder type
Charity

Funder Name
Lundbeck Foundation

Alternative Name(s)
Lundbeckfonden, The Lundbeck Foundation

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
Denmark

Results and Publications

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.

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet	13C substudy version 2.0	28/09/2022	16/11/2023	No	Yes
Participant information sheet	DMI substudy version 2.0	28/09/2022	16/11/2023	No	Yes
Participant information sheet	Participant information sheet version 2.0	11/11/2025	11/11/2025	No	Yes
Protocol file		28/09/2022	16/11/2023	No	No