CLOSER TO A CURE

—15 YEARS OF IMPACT—

Brain Tumour Research

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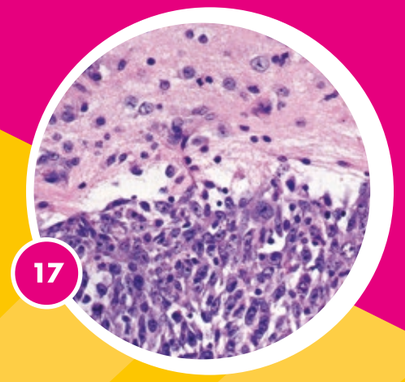

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FOREWORD
DAN KNOWLES, CEO

As CEO of Brain Tumour Research, I am extremely proud to be introducing this report, Closer to a Cure – 15 Years of Impact, which sets out the incredible progress and achievements of our research programme since we were formed in 2009.

Our Charity was founded by a small nucleus of families who had all been affected by this most devastating of diagnoses. Their aim was straightforward yet ambitious: to raise awareness of brain tumours (which kill more children and adults under the age of 40 than any other cancer); to increase the national funding to help find a cure; and to build fundraising capacity to establish our own Research Centres.

Much has happened in the years since 2009. We fund five Brain Tumour Research Centres of Excellence at UK universities, delivering world-class cutting-edge research on a daily basis. We have influenced a substantial increase in the national funding as well as supporting a range of other initiatives which you can read more about on the following pages.

We are grateful for the ongoing commitment and loyalty of our community of supporters without whom this progress would not have been possible. As always, we are conscious that this vital support is largely motivated by personal tragedy and hardship, and by a dedication and devotion to ensure brain tumour patients and their families are better served in the future.

Much work remains but, as we reach this 15-year landmark, it is fitting that we pause to celebrate significant strides: our Charity has awarded £23.2 million to research with £18.2 million of this invested directly into our Centres of Excellence. Our Centre-funding model means our researchers have been able to leverage an additional £23.2 million from other funders, resulting in a total contribution to the national investment of £46.4 million.

Since their launch, our Centres have been at the forefront of groundbreaking research and their work has led to numerous clinical trials for brain tumour patients. They have contributed significantly to our understanding of brain tumour biology and will continue to provide insights that will benefit patients now and in the future.

A cornerstone of our progress has been collaboration. We have embraced partnerships with charity groups and government funding bodies alike, to not only further research into brain tumours, but to help to identify and address unmet needs and overcome barriers to world-class research.

The process of reporting and acknowledging our achievements redoubles our commitment; we will continue to support innovative research, foster collaboration, and fund projects with strategic potential to make a significant impact.

With continued support and dedication of our donors, supporters, campaigners and researchers, we remain confident that we will achieve our vision to find a cure for all types of brain tumours.

I would like to say thank you to all those who have supported our Charity since we began, to our researchers who do so much valuable work, to those that have contributed to this excellent report, and, most of all, to every member of the brain tumour community who provide so much inspiration to us on a daily basis.

If you would like to find out more about our work, or discover ways to support us, please don't hesitate to get in touch via our website or our vibrant social media channels.

Together we will find a cure.

Dan Knowles

Dan Knowles,
CEO, Brain Tumour Research

WHAT BRAIN TUMOUR RESEARCH SET OUT TO ACHIEVE

Brain Tumour Research was born out of loss when a number of families united in desperation having been affected by this most devastating of diagnoses.

Their experience was that there were few effective treatment options and little or no progress had been made for decades.

Research scientists were relying on a handful of small family-led brain tumour charities for funding and, in 2009, the national spend on brain tumours stood at less than £4 million – significantly less than other cancers, including leukaemia which had a national investment of £30 million[1]. In April 2009, united in their mission to raise awareness and increase funding for vital research, founding members of Brain Tumour Research had galvanised enough support and momentum to launch the Charity.

Their objectives were two-fold: to campaign to increase the national investment in research into brain tumours to £35 million a year, in line with breast cancer and leukaemia research, and to build fundraising capability to establish seven Brain Tumour Research Centres of Excellence.

Now, 15 years later, the Charity is in touching distance of its ambition to fund seven dedicated Centres of Excellence across the UK working on low-grade (non-cancerous, sometimes referred to as benign) and high-grade (cancerous, sometimes referred to as malignant) brain tumours. Over and above the ambition to fund seven Research Centres, and to address the barriers slowing down research progress, the Charity also identified, and funds, four vital initiatives designed to support researchers.

The Charity has been instrumental in increasing the national annual spend on brain tumours to more than £17 million[1]. And of the money raised by the Charity, £23.2 million has been awarded to research, with £18.2 million going directly to the Centres of Excellence. The Centre-funding model adopted by the Charity has allowed our researchers to leverage a further £23.2 million from other funders, resulting in a total contribution of £46.4 million to the national investment in research into brain tumours over 15 years.

We are proud to highlight the progress and achievements of Brain Tumour Research, and showcase the pioneering research funded by the Charity.

Brain Tumour Research remains grateful for the resolve of our founding members and the ongoing dedication of our supporters, fundraisers, campaigners, volunteers and researchers. All have been instrumental in getting us closer to a cure for this devasting disease.

OUR VISION

To find a cure for all types of brain tumours

OUR MISSION

To increase the UK investment in brain tumour research

FOUNDER AND FORMER CEO SUE FARRINGTON SMITH MBE

When my sister's little girl Alison Phelan was diagnosed with a brainstem glioma on 15th August 2000, we were shocked and horrified to discover there was no cure and how little funding there was for brain tumour research in the UK. We went to conferences run by the then UK Brain Tumour Society and met research scientists desperate to undertake research in this area. They were relying on a handful of small family-led brain tumour charities to provide funding for their work to understand the causes and discover treatments for this devastating disease.

In 2002, less than £1million was being spent on research into brain tumours in the UK. Along with other brain tumour charities, we vowed to change this situation and raise awareness among MPs of the historic underfunding in this field when compared to other cancers. This led to the first ever debate on brain tumours in the House of Commons in April 2004 – initiated by the then MP John Bercow – and us establishing the All-Party Parliamentary Group on Brain Tumours with him in July 2005.

In parallel, we did what we could to raise funds in our communities to support research projects. By 2008, having listened to the researchers, we realised we needed to come together to establish a national brain tumour charity focused on finding a cure through the establishment of Research Centres of Excellence. On 28th April 2009, 14 brain tumour charities attended the launch of Brain Tumour Research at the House of Commons. Our mission was to raise awareness and increase funding for vital research.

It was our belief that, with secure long-term funding covering the key salaried positions across Brain Tumour Research Centres of Excellence, scientists would be freed from the limitations of applying for a series of short-term specific project grants to secure career opportunities and deliver long-term research. Our Centres would be able to recruit and train promising researchers who might otherwise be drawn into other cancer research areas which had traditionally attracted greater funding, with greater prospects and job security. Over time, as specialist brain tumour expertise and knowledge were built, it was our plan that early career researchers, who were experienced and knowledgeable in the field, would move between Centres to support cross-pollination of the very best thinking at the cutting-edge of research into brain tumours.

With a growing ability to build outstanding teams of collaborative researchers amongst the academic and medical communities, we expected our Centres to be well-placed to develop long-term strategic research plans to explore new avenues and potentially find the key breakthroughs that the brain tumour world so desperately needed. Working together our Lead Investigators and their teams would gain a greater understanding of brain tumours and identify ways in which they could be treated effectively.

Our funding strategy was to invest in long-term research, building the 'critical mass' of expertise needed to accelerate the journey to find a cure. In turn, this would facilitate increased research investment from other sources and grow the overall capacity for brain tumour research within the UK.

Sue Farrington Smith MBE,
Founder and Former CEO, Brain Tumour Research

OUR RESEARCH AIMS

To deliver progress towards our vision of finding a cure for all types of brain tumours, our research aims are built around three pillars, which will see us:

GROW CAPACITY

Attract and retain talented researchers to increase the quantity of brain tumour research taking place in the UK

BUILD INFRASTRUCTURE

Support the research infrastructure, connecting and improving coordination across the UK brain tumour research community

ACCELERATE TREATMENTS

Improve the quality of brain tumour research in the UK and support innovative research to generate new treatments for brain tumours

"By strategically allocating our resources, we foster innovation and collaboration, ultimately accelerating the development of new treatments and improving patient outcomes. We are working towards a future where a brain tumour diagnosis doesn't begin a narrative of anxiety and distress with milestones of devastating interventions and increasing isolation, but instead begins a thoughtful, informed, personalised journey driven by hope, choice and a belief that you will get better and not worse."

Dr Karen Noble, Director of Research, Policy and Innovation, Brain Tumour Research

"The Board are primarily tasked with ensuring that the research that the Charity funds is of high quality, competitive with the best in the world, and that it stands a chance of producing new effective treatments. To achieve this, we embarked on a programme of Centre development which helps drive us towards this goal by ensuring support, resources and the personnel in sufficient amounts to make the research feasible, productive and of high quality with a strong lifeblood of champions and new young researchers to see the work through.

Brain tumours not only threaten life but also threaten personality, independence and family members. Despite over 20 years of research since the publication of the human genome project, very few new treatments have filtered through to result in cancer cures. Only detailed, good, innovative and painstaking research will take us forward and the Charity recognises this in the work of the Scientific and Medical Advisory Board (SMAB) to support and appraise the plans and output of our increasing number of Research Centres.

The work we do to bring this together is challenging, complicated and demanding but the need is desperate and ongoing. The SMAB that I have been able to lead in the last few years is now realising some real 'green shoots' that excite and sustain us towards finding cures for these most devastating of diseases."

Professor Garth Cruickshank, Former Chair of the Brain Tumour Research SMAB 2018-2024

IMPACT AT A GLANCE

TOTAL OF **£23.2 Million** AWARDED TO RESEARCH

£18.2 MILLION awarded to Centres of Excellence.

Brain Tumour Research funding has underpinned **167 PUBLICATIONS**

Brain Tumour Research now funds **FIVE** Centres of Excellence and **FOUR** Funded Initiatives nationwide

Centres of Excellence have leveraged **£23.2 MILLION**

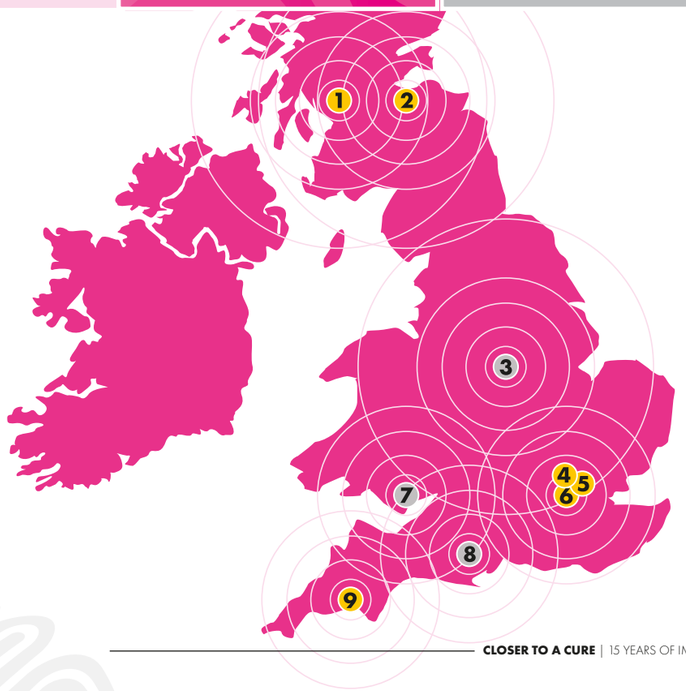
We launched our first paediatric focused **CENTRE OF EXCELLENCE** in September 2023.

Brain Tumour Research has funded **39 PhD STUDENTS**

Through our Funded Initiatives, we have supported more than **130 RESEARCH PROJECTS** into brain tumours.

We have contributed **£46.4 MILLION** to the national investment in brain tumours.

We have supported **260 RESEARCH PERSONNEL**



BRAIN TUMOUR RESEARCH CENTRES OF EXCELLENCE AND FUNDED INITIATIVES

1. The University of Glasgow
2. The University of Edinburgh
3. PRIME at brainstrust
4. Imperial College London
5. Queen Mary University of London
6. Institute of Cancer Research
7. Cardiff University - MRC Partnership
8. BRAIN UK at Southampton University
9. The University of Plymouth

BTR-NTA: Nationwide

15 YEARS OF IMPACT

2009

Brain Tumour Research was launched in April 2009 when 14 brain tumour charities united with a mission to raise awareness and increase funding for vital research.

2010

The Brain Tumour Research Centre of Excellence at The University of Portsmouth was launched in collaboration with Member Charities Ali's Dream and Charlie's Challenge.

Funding for Portsmouth concluded in 2019

2013

Brain Tumour Research announced funding to support BRAIN UK, a virtual tissuebank providing researchers with a vital resource.

2014
OCTOBER

The Brain Tumour Research Centre of Excellence at Queen Mary University of London was launched.

2014
NOVEMBER

The Brain Tumour Research Centre of Excellence at The University of Plymouth was launched.

2015

The Brain Tumour Research Centre of Excellence at Imperial College London was launched.

2022
MAY

Brain Tumour Research, in partnership with brainstrust, announced its funding of Patient Research Involvement Movement (PRIME).

2022
JUNE

Brain Tumour Research, in partnership with the Tessa Jowell Brain Cancer Mission, launched the Brain Tumour Research Novel Therapeutics Accelerator (BTR-NTA).

2023
SEPTEMBER

The Brain Tumour Research Centre of Excellence at The Institute of Cancer Research was launched.

2023
SEPTEMBER

Brain Tumour Research announced its partnership with the Medical Research Council to fund research at Cardiff University, Wales.

2024

Brain Tumour Research partnered with the Glasgow-based Beatson Cancer Charity to raise the funds needed to establish the Scottish Brain Tumour Research Centre of Excellence.

2025
JANUARY

The Scottish Brain Tumour Research Centre of Excellence at the Universities of Edinburgh and Glasgow was launched.

2025

Announcement of plans for our sixth Centre of Excellence.

PERSONALISED TREATMENTS FOR BRAIN TUMOUR PATIENTS

Glioblastoma, a form of glioma, is the most common high-grade primary brain tumour in adults, with 3,200 people diagnosed in the UK each year[2]. Despite advancements in the diagnosis and categorisation of glioblastoma tumours, survival rates remain low, with most patients dying of the disease between 12 and 15 months from diagnosis[3]. Treatment for glioblastoma includes surgery, followed by radiotherapy and chemotherapy. This has remained unchanged for decades and progress for new treatment options has been incredibly slow.

Glioblastoma tumours vary significantly between patients, and this variability is one of the reasons why many clinical trials for glioblastoma have failed in recent years. Although some treatments have worked for a few patients, they haven't improved outcomes substantially, or for everyone.

Brain Tumour Research understands that the complexity and diversity of glioblastoma tumours mean that the current 'one-size-fits-all' approach to treatment is not sufficient, and a more personalised approach is required.

The Charity funds research at our Centres of Excellence to not only further our understanding of the biology of glioblastoma tumours and what causes them to grow and progress, but also to discover a way to deliver tailored treatment choices for patients – overcoming the variability of outcomes between patients.

DEVELOPING PERSONALISED TREATMENTS FOR BRAIN TUMOUR PATIENTS[4, 5]

Professor Silvia Marino, *Director of the Brain Tumour Research Centre of Excellence at Queen Mary University of London*

In a world first, researchers at the Brain Tumour Research Centre of Excellence at Queen Mary University of London have tested a new approach where they compare healthy and glioblastoma cells from the same patient. With this new approach they can unlock valuable information which is set to transform treatment in the future.

The development of this innovative cell comparison platform is a culmination of a decade's work, made possible by Brain Tumour Research funding. The platform can be used to identify specific changes in tumour cells that cause a patient's tumour to grow and progress and predict the effectiveness of new or repurposed drugs on the tumour. The approach can be used to provide bespoke, patient-matched predictions of effective treatment options, marking a significant step towards truly personalised treatments for glioblastoma patients.

A National Institute for Health and Care Research (NIHR) – Clinical Research Network (CRN) supported observational trial, testing this approach, opened in August 2024 at the Barts Brain Tumour Centre.

The science behind personalised treatment

In glioblastoma, certain genes that should be inactive are active, leading to uncontrolled cell growth and the formation of a tumour. Professor Marino's team and co-investigators Dr Radu Zabet, who is based at the Blizard Institute and Dr Lovorka Stojic, at Barts Cancer Institute, are investigating which genes are incorrectly activated to understand and potentially treat the tumour.

Researchers have developed a unique way to compare diseased and healthy cells from the same person, allowing them to identify genes that are vital to cancer growth. Their goal is to find and test drugs that can deactivate these genes and stop the tumour growth for individual patients, as well as use the information to understand more about the biology of glioblastoma tumours.

As a result of their research, they have made significant discoveries, including:

- The identification of multiple genes crucial to glioblastoma growth
- Understanding the different methods that glioblastoma cells use to turn genes on or off
- Identifying new glioblastoma sub-groups with bespoke treatment options

Translating research into patient care

After demonstrating the potential of the platform in a small cohort of patients in 2021, Professor Marino, in collaboration with Dr Thomas Millner at the Blizard Institute, and the Barts Brain Tumour Centre, launched a large clinical study to further refine the cell comparison platform in August 2024.

The study, which is enrolling as many as 200 patients with suspected high-grade glioma, is designed to assess the feasibility of comparing healthy cells and tumour cells in a clinical setting. They want to understand whether it can be done in a suitable timeframe; whether clinicians can get effective predictions that they can use on patients; and whether the predictions can be tested in the laboratory to ensure their effectiveness before giving them to patients.

If the laboratory findings are replicated in patients, this will be a step towards truly personalised treatments for glioblastoma patients.

It would lead to the development of a multicentre trial where patients will be treated according to their drug predictions, assessing their impact on overall survival. A positive outcome would mean those presenting with this type of tumour in the future would be on a treatment pathway tailored to the unique makeup of their tumour.

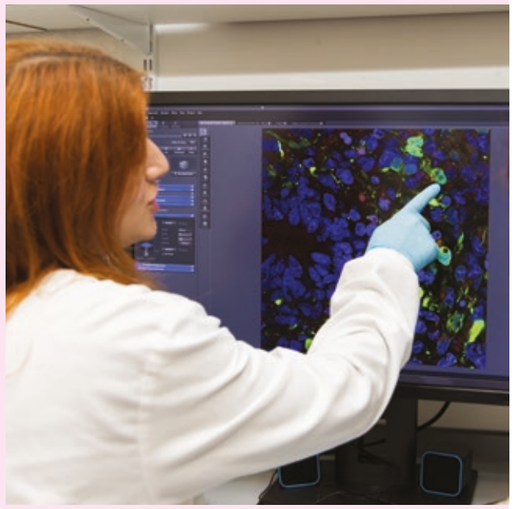
> ***"Although the clinical trial is not yet at a stage where patients will be given the drugs based on their prediction, with further research we are optimistic this could be available to patients in the near future."***
>
> - Professor Marino

UNDERSTANDING WHAT CONTROLS THE GROWTH OF GLIOBLASTOMA TUMOURS[6]

Dr Myrianni Constantinou, former *PhD Student at the Brain Tumour Research Centre of Excellence at Queen Mary University of London*

Using the cell comparison platform, researchers have shown that a gene known as METTL7B is essential in regulating the growth of glioblastoma.

Dr Constantinou discovered that the gene is overactive in glioblastoma tumours but when the gene was silenced, the resultant tumours were significantly smaller. The tumour cells however travelled more into the surrounding areas of the brain making the tumour more invasive. This early-stage research has provided valuable insights into glioblastoma tumour growth and has suggested that targeting METTL7B in combination with drugs to reduce invasiveness could improve patient outcomes.



GROUPING GLIOBLASTOMA TUMOURS TO INFORM TREATMENTS[7]

Dr James Boot, former *PhD student at the Brain Tumour Research Centre of Excellence at Queen Mary University of London*

Using the cell comparison platform, researchers have found that some glioblastoma tumours have unique features which could be exploited in the future to improve treatments for patients living with glioblastoma.

This newly-identified subgroup of glioblastoma tumours has an increased ability to invade surrounding healthy brain tissue and contains different proportions of immune cells compared to other glioblastoma tumours.

Identifying tumours with these traits could have important implications for patients undergoing treatments which rely on the effectiveness of immune system mechanisms and provides an opportunity for the development of more precise therapies that improve patient outcomes.

ACCELERATING CLINICAL TRIALS FOR GLIOBLASTOMA PATIENTS IN SCOTLAND

Professor Steven Pollard, *University of Edinburgh and* **Professor Anthony Chalmers,** *University of Glasgow*

In 2024, Brain Tumour Research partnered with Beatson Cancer Charity to fund the Scottish Brain Tumour Research Centre of Excellence at the Universities of Edinburgh and Glasgow. Launched in January 2025, with £2.4 million funding over five years, the Centre is led by Professor Steven Pollard and Professor Anthony Chalmers and is ensuring that new discoveries quickly advance to clinical trials for brain tumour patients in Scotland and beyond.

The Centre addresses the *"translational gap"* – the challenge of moving laboratory discoveries into clinical testing – by focusing on discovering new drugs, developing better disease models, and personalising treatments for glioblastoma patients. This multidisciplinary approach aims to provide the preclinical data needed to attract investment to fund clinical trials.

Home to the UK's largest group of multidisciplinary glioblastoma researchers, the Centre is refining its drug discovery platform to better replicate real-world tumours, enable testing of new treatments in combination with chemotherapy and radiotherapy, and incorporating immune cells that influence tumour growth and response to treatment. This accuracy will improve the reliability of drug testing results, increasing the likelihood of success in human trials – an area where most new discoveries fail.

Additionally, the Centre is committed to training the next generation of researchers through PhD studentships and research assistant positions, providing support and resources to foster new approaches.

Through innovative research, collaboration and close links between academic and clinical research groups, the new Scottish Centre is transforming brain tumour treatment and bringing new hope to patients and their families.

Patient case study:

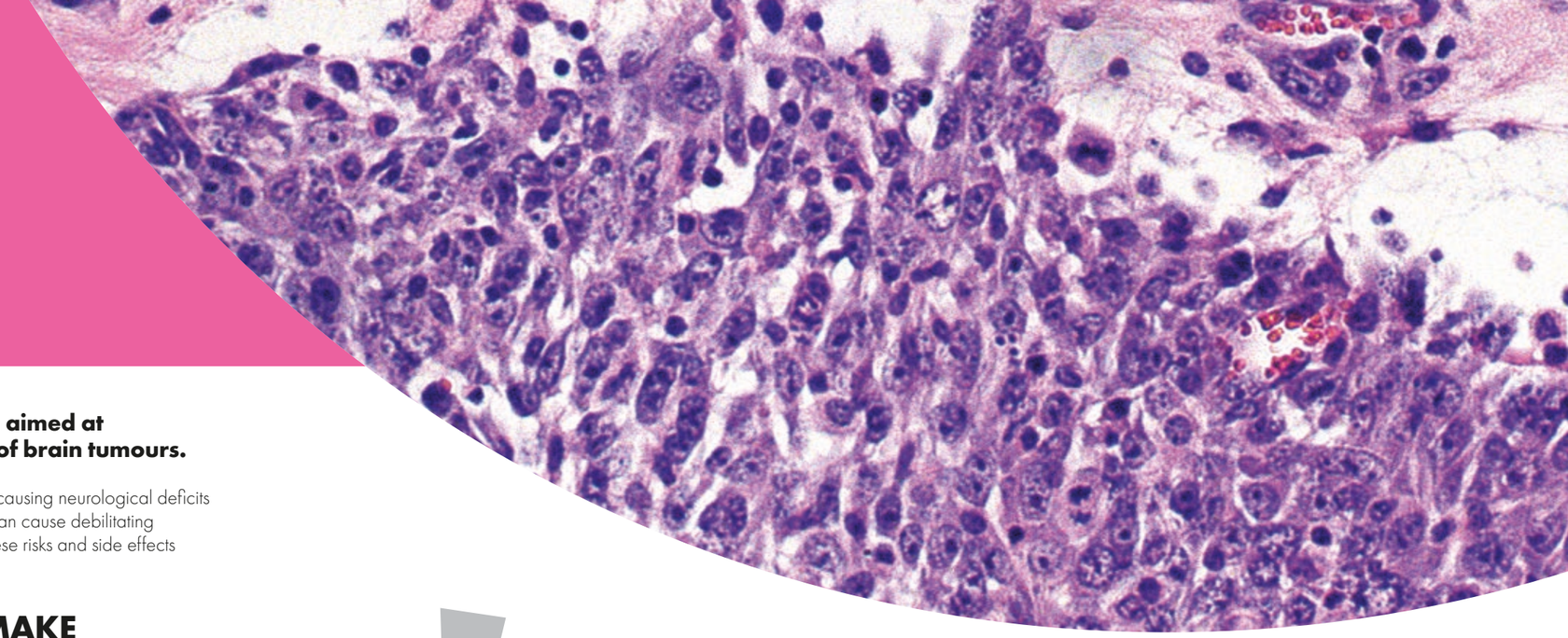
THEO BURRELL

BBC *Antiques Roadshow* expert Theo Burrell, 38, became Patron of Brain Tumour Research in November 2023, having been diagnosed with a glioblastoma in June 2022.

"Being told you have an aggressive brain tumour is absolutely terrifying. I visited multiple doctors with awful migraines, prolonged sickness and problems with my sight. No one knew what was wrong and, when I finally had a scan, I was told I had brain cancer and, without surgery, had just three months to live. I'm frustrated it took so long to get my diagnosis; we need to change that and it's vital the Government invests more money into research in order to improve treatments in future and, ultimately, to find a cure.

I visited the Brain Tumour Research Centre of Excellence at Queen Mary University of London to see what the world-leading research the charity is funding, and I helped launch the Scottish Brain Tumour Research Centre of Excellence in Scotland. The game-changing research here is incredibly exciting and I am hopeful it will lead to new clinical trials for glioblastoma patients in Scotland like me."

IMPROVING EXISTING THERAPIES



Brain Tumour Research plays a key role in supporting research aimed at improving the effectiveness of current treatments for all types of brain tumours.

The reality of brain tumour treatment is well documented; surgery brings with it a high risk of causing neurological deficits and both radiotherapy and chemotherapy are hugely gruelling as the toxins and radiation can cause debilitating sickness and fatigue. By investing in this research, Brain Tumour Research seeks to reduce these risks and side effects while striving to increase survival rates and improve the overall quality of life for patients.

ARGININE DEPRIVATION – A METHOD TO MAKE EXISTING THERAPIES MORE EFFECTIVE?[8, 9, 10, 11, 12]

Dr Nelofer Syed, *Principal Investigator at the Brain Tumour Research Centre of Excellence at Imperial College London*

Radiotherapy and chemotherapy (temozolomide or TMZ) are front-line treatments for high-grade glioma tumours, including glioblastoma. Despite these interventions, eventually nearly all glioblastoma tumours recur, and the prognosis for patients remains incredibly poor.

Dr Syed has pioneered the use of arginine deprivation to enhance the effectiveness of current treatments for glioblastoma patients. Her groundbreaking research, part-funded by Brain Tumour Research and its Member Charity Brain Tumour Research Campaign, has opened new avenues for therapy and paved the way for multiple early-phase clinical trials.

The science behind arginine deprivation

Arginine is an amino acid essential for protein synthesis and cell survival. Some cancer cells become dependent on the external supply of arginine to survive and grow as they are unable to make their own. Depleting the body's supply of arginine can cause arginine-dependent cancer cells to die while leaving the patient's normal cells unharmed. This approach is being explored across various cancer types, including breast cancer and non-small cell lung cancer.

Until Dr Syed's breakthrough in 2013, research on arginine deprivation excluded brain tumours. Dr Syed's research revealed that a subset of glioblastoma tumours depend critically on arginine, making them vulnerable to deprivation. This breakthrough led to an exclusive partnership with Polaris Pharmaceuticals and the inclusion of glioma patients in an early-phase clinical trial of ADI-PEG 20, an arginine-degrading enzyme produced by Polaris.

What has our funding enabled?

Since this breakthrough, the team has worked to understand the potential of arginine deprivation using ADI-PEG 20 for glioblastoma patients. They proved that even the glioblastoma cells that can produce their own arginine become more susceptible to radiotherapy when treated in combination with ADI-PEG20.

Using the combination treatment, Dr Syed and her team, Dr Nabil Hajji and Dr Manuel Sarmiento, were able to eradicate glioblastoma tumours in the laboratory and remove the immunosuppression commonly seen in glioblastoma, increasing the likelihood of immune cells attacking and removing tumour cells. The long-term survival of the models surprised even the researchers themselves. The publication of this research in 2022 paved the way for a clinical trial in Taiwan, evaluating ADI-PEG 20's efficacy with radiotherapy and chemotherapy in glioblastoma patients. The trial is set to complete by the end of 2026. In addition, Dr Syed's team is now investigating how the immune system is activated by these therapies and whether they can enhance the effects of new immunotherapies.

Translating research into patient care

Since 2005, ADI-PEG 20 has been tested in clinical trials for various cancers, including melanoma, acute myeloid leukaemia, and non-small cell lung cancer, which established its therapeutic dose and safety profile.

The work funded by Brain Tumour Research has provided proof-of-principle that depleting the body's blood concentration of arginine is a promising therapeutic strategy for all glioblastoma patients, whether their cells can make arginine or not. It has led to ADI-PEG 20's inclusion in multiple early-phase clinical trials, including the international Phase 2/3 trial GBM AGILE, for newly diagnosed and recurrent glioblastoma, which opened in August 2023.

What's great about this therapeutic strategy is that the drug does not need to cross the blood-brain barrier (BBB) into the brain to work. The BBB protects the brain from external toxins and diseases by restricting what can, and cannot, enter the brain from the body's blood supply. This means the BBB restricts the movement of most medicines into the brain, making it very difficult to treat certain conditions and diseases.

The future of arginine deprivation in glioblastoma treatment

Under the leadership of clinical oncologist, Dr Matt Williams, the team at Imperial College is developing a window-of-opportunity clinical trial that will see patients treated with ADI-PEG 20 in combination with radiotherapy prior to surgery, followed by standard care.

The project named WISTERIAN, funded by Brain Tumour Research, will enable researchers to understand how ADI-PEG 20 in combination with radiotherapy affects tumour cells in patients, furthering our understanding of its role in glioblastoma treatment, providing the evidence for larger clinical trials, and ultimately improving the lives of patients with this devastating tumour.

ENHANCING CHEMOTHERAPY[13]

Dr Richard Perryman, *Post Doctoral Researcher at the Brain Tumour Research Centre of Excellence at Imperial College London*

Researchers at the Brain Tumour Research Centre of Excellence at Imperial College London have demonstrated that a drug known as FK866 (daporinad) could significantly enhance effectiveness of chemotherapy - the standard of care for glioblastoma.

Dr Perryman showed that this drug blocks NAD production, a chemical that fuels cancer cell growth, boosting the effectiveness of TMZ.

The study highlights the potential of FK866 to improve existing treatments. The next steps involve generating more data to support an early phase clinical trial, which could pave the way for new treatment options for patients.

RETHINKING NEUROSURGERY WITH REAL-TIME IMAGING

Mr Kevin O'Neill, *Principal Investigator at the Brain Tumour Research Centre of Excellence at Imperial College London and Consultant Neurosurgeon at Imperial College Healthcare NHS Trust*

Improving intraoperative imaging techniques is crucial for enhancing patient outcomes in brain tumour surgeries. Surgical removal of brain tumours is the primary treatment option for the majority of patients, and it is well known that the amount of tumour removed is directly linked with overall prognosis and patient outcomes. Currently, pre-operative imaging, such as MRI and CT scans, is routinely used to plan brain tumour surgery. However, this method is limited in accuracy and is affected by unpredictable movements of the brain between imaging and surgery. Supporting surgeons to distinguish between tumour and normal brain tissue with greater precision during surgery will reduce the risk of damaging healthy tissue and improve the chances of complete tumour removal.

Research teams at our Centre of Excellence at Imperial College London, which includes Charing Cross Hospital, have been pioneering the use and development of intraoperative tools in clinical practice since its launch in 2015. Techniques such as multispectral imaging, intraoperative ultrasound and Raman spectroscopy have the potential to not only make surgeries safer, but also significantly enhance the effectiveness of treatments, offering hope for better survival rates and quality of life for patients.

ENHANCING PRECISION AND SAFETY IN BRAIN TUMOUR OPERATIONS[14]

Dr Giulio Anichini, *Clinical Research Fellow at the Brain Tumour Research Centre of Excellence at Imperial College London and Neurosurgical Fellow at Imperial College Healthcare NHS Trust*

Using a special imaging technique called multispectral imaging (MSI), Dr Anichini and Dan Elson, Professor of Surgical Imaging and Biophotonics at the Hamlyn Centre of Robotics at Imperial College London, have found a way to support neurosurgeons to better differentiate between tumour cells and healthy brain tissue during surgery.

Glioma tumours, such as astrocytomas and oligodendrogliomas are diffuse, which means they have no clear boundary, and therefore no clear indication of where the tumour ends and normal brain tissue begins. The brain also has areas of vital importance that must be preserved to avoid permanent disability following surgery.

Multispectral imaging is a technique that records which light frequencies are either absorbed or reflected by any small area of tissue. The research team has proved that it can be used to accurately distinguish between glioma and meningioma tumour tissue, and healthy tissue and to see which parts of the brain are active during tasks like speaking or moving, especially during surgery where the patient is conscious.

The use of this *'bionic eye'* could help surgeons remove as much brain tumour tissue as possible while avoiding damaging important brain areas, reducing the risk of post-operative disability and stroke.

REAL-TIME MOLECULAR DIAGNOSIS DURING SURGERY[15]

Dr Babar Vaqas, *Clinical Research Fellow at the Brain Tumour Research Centre of Excellence at Imperial College London, and Specialist Lead for Neurology at Anglia Ruskin University*

Dr Vaqas has worked with Zoltan Takats, Professor of Analytical Chemistry at Imperial College London and Professor Haishan Zeng from the British Columbia Cancer Research Agency to demonstrate that Raman spectroscopy and intraoperative mass spectrometry can be used in surgery to diagnose brain tumours in real-time, providing surgeons with immediate diagnostic feedback, aiding in treatment decisions during surgery.

The use of Raman spectroscopy during surgery is a cutting-edge technique that can provide real-time molecular diagnosis for neurosurgeons. A laser is shone onto the brain during surgery. Some of the light interacts with the tissue and is reflected or captured. Subtle variations within the tissue generate variations within the reflected light. This creates unique molecular 'fingerprints' for different types or regions of tissue.

In one of a number of clinical studies undertaken at the Centre, the research team showed that combining Raman spectroscopy with artificial intelligence could accurately detect key mutations in human glioma, drastically shortening the time to diagnosis and first treatment. They also demonstrated that the technology could be used to distinguish between normal brain tissue and tumour tissue with high accuracy, helping surgeons remove the tumour more precisely, while minimising damage to healthy brain tissue. Imperial is one of only two centres worldwide to be developing this cutting-edge technology.

Raman spectroscopy has the potential to revolutionise how brain tumours and other conditions are treated by offering precise and immediate information about the tissue being operated on, leading to better surgical outcomes and enabling patients to start additional treatments sooner.

INTRAOPERATIVE ULTRASOUND[16, 17, 18, 19]

Mr Kevin O'Neill and **Miss Sophie Camp,** *Consultant Neurosurgeons at Imperial College Healthcare NHS Trust and Principal Investigators at the Brain Tumour Research Centre of Excellence at Imperial College London*

Mr O'Neill and Miss Camp have made significant strides in using intraoperative three-dimensional ultrasound (i3DUS) during brain surgery.

i3DUS provides real-time, 3D images of the brain, helping surgeons see the tumour and surrounding tissue more clearly. Unlike traditional MRI, i3DUS is cost-effective, portable, and quick, making it a practical choice for surgery.

In a clinical study that took place at the Centre, researchers worked with 97 patients who had different types of glioma brain tumours. During surgery, they used i3DUS to take real-time, 3D images of the brain and the tumours. They also took small tissue samples (biopsies) from different parts of the tumours.

They found that that the data in the images matched well with the actual makeup of the tumour cells, demonstrating that i3DUS can tell doctors how dense and varied the cells are. This helps surgeons see the tumour more clearly and make sure they remove as much of it as possible during surgery.

What next?

Looking to the future, the integration of intraoperative 3D-ultrasound and multispectral imaging, alongside the established high-powered microscope technology known as probe-based confocal laser endomicroscopy, into a single, multi-functional tool is poised to transform neurosurgery. While each technique can be used individually, their combination could significantly enhance surgical precision and improve patient outcomes.

In the coming years, the research teams at Imperial College London and Charing Cross Hospital will continue to refine the technologies and their deployment during surgery. The combined tools are expected to be fully integrated into the neurosurgical standard of practice to enhance the extent of resection of a range of brain tumour types, identify highly functional brain areas, and consequently reduce the possibility of post-operative disabilities.

NEW TREATMENTS FOR LOW-GRADE BRAIN TUMOURS

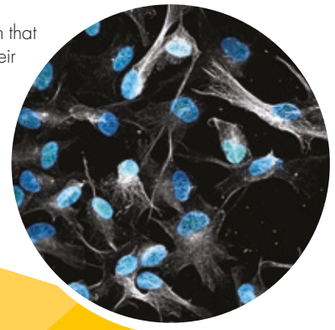
By supporting groundbreaking research into low-grade brain tumours, Brain Tumour Research aims to create new minimally-invasive treatments that could significantly enhance the lives of patients with tumours such as schwannoma and meningioma. For these individuals, who currently depend on high-risk surgeries for tumour removal, research funded by the Charity offers hope for a better future.

REPURPOSING HIV MEDICATION TO TREAT SCHWANNOMA AND MENINGIOMA TUMOURS[20, 21]

Professor Oliver Hanemann, *Director of the Brain Tumour Research Centre of Excellence at the University of Plymouth*

Professor Hanemann and Dr Sylwia Ammoun from the Brain Tumour Research Centre of Excellence at the University of Plymouth have spearheaded the testing of HIV anti-retroviral medications as a non-invasive, systemic treatment for patients with inherited neurofibromatosis type 2 (NF2) or NF2-related tumours, leading to the launch of the early phase clinical trial, RETREAT.

Individuals with the rare, inherited genetic condition, NF2, do not produce a protein called Merlin that suppresses tumour growth. This leaves them prone to developing multiple low-grade tumours in their central and peripheral nervous system, such as schwannoma, meningioma and ependymoma. These can have a profound impact on their quality of life, especially if their tumour burden is very high. At present, the main treatments available are surgery and radiation, both of which carry the risk of long-term complications. Effective and safe drug treatments are urgently needed.



FACT FILE

Meningioma and schwannoma tumours (including acoustic neuroma) are types of low-grade brain tumours that can significantly impact patients' lives. Meningiomas originate from the meninges, the protective layers surrounding the brain and spinal cord, and are the most common primary brain tumours in adults. Schwannomas, on the other hand, develop from schwann cells, which electrically insulate nerves. They are often associated with the genetic condition neurofibromatosis type 2 (NF2). While these tumours are typically low-grade/non-cancerous, their location can lead to serious complications, including hearing loss, balance issues, and other neurological deficits. Current treatments often involve surgery and radiotherapy.

Cells can also spontaneously lose the ability to make the protein, Merlin. This is the main cause of non-inherited meningioma or schwannoma tumours (including acoustic neuroma), which are the most common brain tumours in adults, affecting on average 2,790 people in England per year.[22] Although they arise due to the same mechanism as the inherited disorder NF2, people usually develop one tumour, not multiple tumours.

The science behind HIV anti-retrovirals for brain tumours

In 2022, Dr Ammoun from Professor Hanemann's team published a game-changing paper that revealed that in NF2-related tumours an inactive sequence of DNA – which became part of the human genome as a result of an ancient viral infection – is reactivated. The sequence, known as Human Endogenous Retrovirus Type K (HERVK), produces proteins that contribute to schwannoma and meningioma growth and development.

The team demonstrated that two medications commonly used to treat HIV, ritonavir and lopinavir, decreased the levels of molecules related to HERVK, and reduced the growth and survival of patient schwannoma and meningioma tumours in the laboratory. Since both ritonavir and lopinavir have already been shown to have a strong safety profile in healthy people and those treated for HIV, the team was able to rapidly translate results in the laboratory into patients.

Translating research into patient care

In collaboration with the University of Plymouth Clinical Trials Unit and funded by the Children's Tumor Foundation, based in the USA, Professor Hanemann and Dr Ammoun, launched the Phase 0 clinical trial in June 2024 to test ritonavir and lopinavir in patients with schwannoma tumours due to the inherited condition, NF2.

The trial is designed to establish if the drugs have the same effect on tumour cells in people as they do in the laboratory, as well as determine the most appropriate biological effective dose.

Professor Hanemann said, *"This could be an important step towards a systemic treatment for tumours related to NF2. If results are positive and the research develops into a larger clinical trial, it would be the most significant change for patients with this condition, for whom there is no effective treatment."*

The future of HIV anti-retrovirals in schwannoma and meningioma treatment

Following a successful Phase 0 trial, researchers at the University of Plymouth's Brain Tumour Research Centre of Excellence are seeking to expand their work into larger, multi-centre clinical trials. These trials will rigorously assess the impact of the HIV anti-retrovirals on tumour burden, as well as on the quality of life for patients suffering from NF2-related schwannoma and meningioma tumours.

Although this early trial focuses on patients with inherited NF2, the treatment shows potential for all schwannomas and meningiomas caused by the same protein loss. Researchers at the Centre will be continuing to expand and develop this promising new treatment for these patients as well.

Patient case study:
JAYNE SWEENEY

At the age of 18, Jayne Sweeney, now 58, from Cornwall, was diagnosed with a golf ball-sized acoustic neuroma. She was later found to have neurofibromatosis type 2 (NF2) and is currently living with 12 tumours on her brain. She has undergone five operations and, after losing hearing in her right ear, faces complete deafness.

"It's clear that Brain Tumour Research is a vital organisation in discovering kinder and more innovative ways to treat brain tumour patients. When I heard about the RETREAT trial at the Brain Tumour Research Centre of Excellence at the University of Plymouth, this only cemented my viewpoint. I thought it was incredibly exciting; any advancement to improve the lives of people living with the disease is brilliant.

My husband Mark has fundraised more than £8,000 for the charity by taking part in Ironman challenges and, in June 2024, we were invited to see how that money is used by the scientists at work in the lab at Plymouth. It felt special to see and hear how dedicated the scientists are. I was amazed at the amount of groundbreaking work being carried out. It was difficult to hear much of what was said but I had Mark with me to relay it all. I am hoping that there will soon be major breakthroughs for future patients."

DEVELOPING LESS INVASIVE-TREATMENTS FOR MENINGIOMA[23]

Dr Sylwia Ammoun, *Senior Research Fellow at the Brain Tumour Research Centre of Excellence at the University of Plymouth*

Led by Dr Sylwia Ammoun, in Professor Hanemann's team, scientists at our Research Centre in Plymouth have shown that targeting a protein called MERTK on tumour cells could revolutionise the treatment of meningiomas, the most common brain tumour in adults, traditionally treated with invasive surgery and radiotherapy. The results also indicate this approach could prove beneficial in the treatment of schwannoma, another type of nervous system tumour.

The study, co-funded by Brain Tumour Research and Animal Free Research UK, revealed that blocking the protein MERTK halted the growth of meningioma and schwannoma tumour cells and reduced the number of tumour-supporting immune cells, which could help reduce the tumour's ability to evade the immune system. This breakthrough offers new hope for patients with these tumours within the next two to four years.

Dr Ammoun, who led the research, said: *"There are many drugs being developed to target MERTK, including some going through clinical trials for other cancer types. Thus, this research offers hope to patients with meningioma and schwannoma tumours that a new treatment may be on the horizon."*

Patient case study:
CRAIG RUSSELL

Netflix star, actor, writer, and producer, Craig Russell was diagnosed with a low-grade meningioma in February 2023. He helped launch Brain Tumour Research's Manifesto at Westminster in March 2024, and became an Ambassador in September 2024.

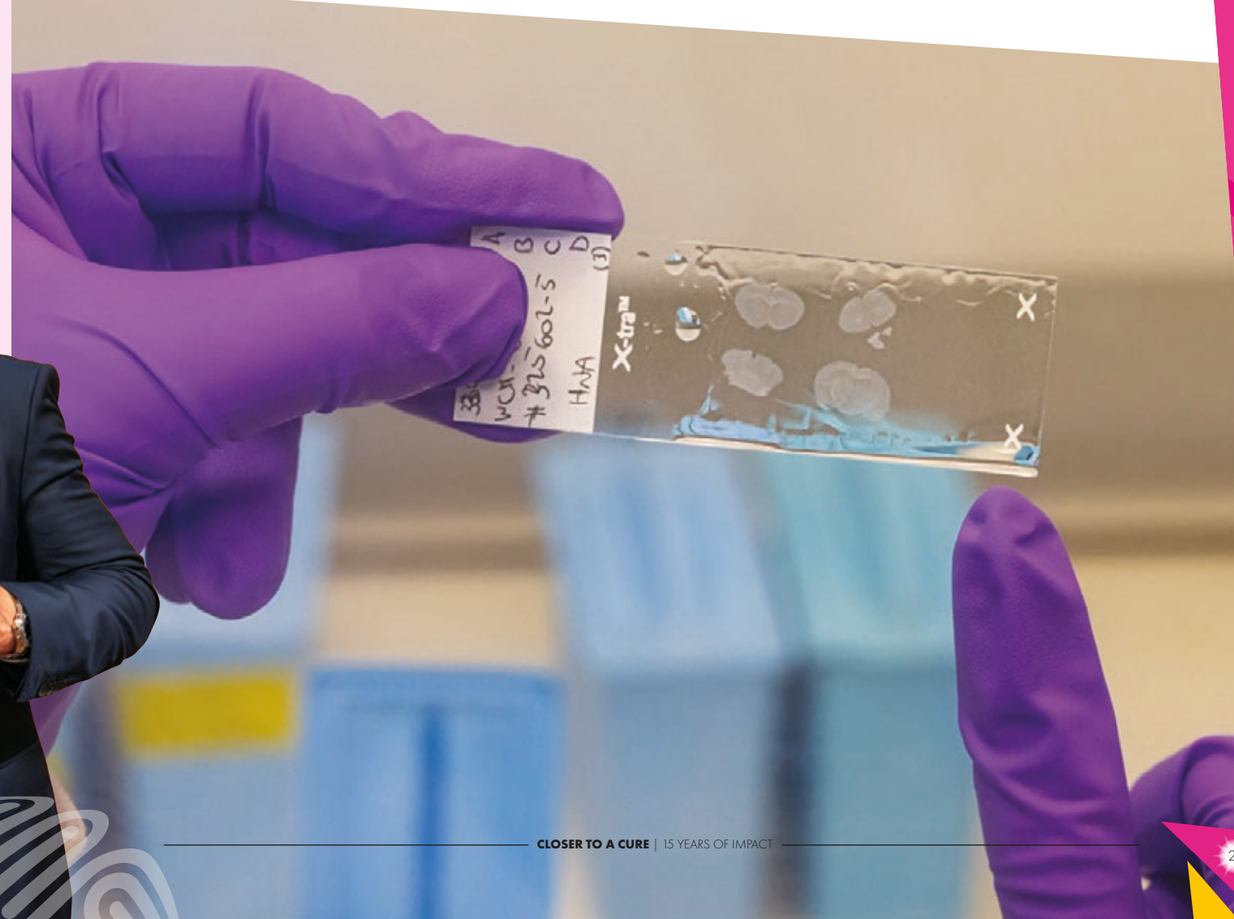
"I've got to witness and experience first-hand the incredible and important work Brain Tumour Research does. Its Centre of Excellence at the University of Plymouth is one of Europe's leading research institutes for low-grade brain tumours, and scientists there have discovered that targeting a particular protein on the surface of tumour cells could be a new approach to treating both meningioma and schwannoma. This is incredibly positive and very exciting. To think that, hopefully in the not-too-distant future, people with low-grade tumours can be treated in this way means that sufferers and their families won't have to go through what my family and I did."

DELIVERING INNOVATIVE TREATMENTS FOR PAEDIATRIC PATIENTS

Paediatric brain tumours present a unique and devastating challenge, profoundly impacting young patients and their families. They kill more children than all other types of cancer and an average of 420 children are diagnosed in the UK each year.[24]

The treatment for brain tumours is complex and tailored to each child. It involves a multidisciplinary team of specialists who may recommend surgery, chemotherapy, or radiotherapy, however unlike adults, children's brains are still developing, making treatments like radiotherapy particularly damaging. While 76.6% of children diagnosed with central nervous system tumours survive for five years or more, 62% of survivors live with life-long disabilities, affecting quality of life and placing immense strain on families.[24, 25]

By investing in innovative translational research, Brain Tumour Research hopes to increase the number of clinical trials for children with brain tumours providing hope for new, kinder and more effective treatments.



ACCELERATING THE LAUNCH OF CLINICAL TRIALS FOR CHILDREN WITH HIGH-GRADE GLIOMAS[26, 27]

Professor Chris Jones, *Director of the Brain Tumour Research Centre of Excellence at The Institute of Cancer Research*

In September 2023, Brain Tumour Research launched its first Centre of Excellence focused solely on paediatric brain tumours at The Institute of Cancer Research (ICR) led by Professor Chris Jones.

The Research Centre is leading the way in the UK for paediatric-type diffuse high-grade glioma (PDHGG) research and is uniquely positioned to speed up the translation of promising new treatments from laboratory testing into clinical trials for children through its relationship with the CONNECT Consortium, a world-wide network of experts focused on setting up and running clinical trials for children with brain tumours.

Professor Jones is the pre-clinical lead for CONNECT, which means the findings of his research team are uniquely positioned for rapid translation into the clinic, ensuring that promising treatments are getting to the patients that desperately need them.

A new combination therapy for diffuse midline glioma (DMG)

Paediatric high-grade gliomas (PDHGG) are a collection of rare but aggressive brain tumours for which there are no effective treatments. They include DMG, previously known as diffuse intrinsic pontine glioma, or DIPG, the deadliest form of childhood cancer which has an average survival of just under 12 months, affecting around 40 children per year in the UK.[28, 29]

Of those children with DMG, 25% have a mutation in a gene known as ACVR1, which plays a significant role in the development and progression of their tumour. Tragically, the presence of this mutation is associated with poorer prognosis and survival rates.

Recently, Professor Jones and his team discovered that, alongside trametinib (a drug already in use for paediatric low-grade gliomas) using an inhibitor to block the effect of the gene mutation could be a promising treatment option. Professor Jones and his team then worked in collaboration with five research laboratories* within CONNECT to simultaneously test the promising drug combination and provide the large bank of evidence required to get the treatment into clinical trial.

In 2024, the TarGeT platform trial was opened by CONNECT (an international clinical trial for PDHGG patients with multiple treatment arms based on specific genetic alterations), which provides a route for new trial arms for drug combinations identified with Professor Jones's laboratory over the coming years.

This is the first of many collaborations the ICR Centre will have with CONNECT laboratory groups around the world, and although the Centre of Excellence at ICR was only established in 2023, it is already directly influencing the launch of clinical trials for paediatric patients.

*CONNECT Consortia partners involved in ACVR1 inhibitor and trametinib testing
Rachid Drissi Lab, Nationwide Children's Hospital, Columbus, Ohio, USA
Nick Vitanza Lab, Seattle Children's Hospital, Washington, USA
Javad Nazarian Lab, Children's National Medical Center, Washington DC, USA
David Ziegler Lab, Children's Cancer Institute Sydney, Australia
Ron Firestein Lab, Hudson Institute, Melbourne, Australia

FACT FILE

The COllaborative Network for NEuro-oncology Clinical Trials Consortium (CONNECT) is a global partnership of research, trial and neuro-oncology experts who conduct clinical trials in high-risk paediatric brain tumours (such as DMG) to investigate combinations of novel drugs with traditional therapies.

Patient case study: EMILY OLIVER

Debi Oliver's daughter Emily died of a DMG in 2019, aged 21. The family has raised £200,000 to fund a DMG-focused project at our ICR Research Centre of Excellence. Debi said:

"We will never get over the pain of losing Emily, but knowing we're doing what she wanted, helping others by funding research into the type of tumour she had, gives us great comfort. We've been looking for a suitable project for some time and are really excited to have finally found one. We wish all those working on it every success."

FINDING KINDER TREATMENTS FOR MEDULLOBLASTOMA[30, 31, 32]

Dr Sara Badodi, *Junior Principal Investigator, and* **Professor Silvia Marino,** *Director of the Brain Tumour Research Centre of Excellence at Queen Mary University of London*

Using the funding provided by Brain Tumour Research, Dr Badodi and Professor Marino have uncovered new treatment options for children with medulloblastoma, the most common high-grade brain tumour in children.

In a breakthrough in 2017, the research team at Queen Mary demonstrated that proteins known as BMI1 and CHD7 play a crucial role in the growth of a subgroup of medulloblastoma tumours known as group 4. BMI1 is a protein that promotes cell growth and survival, whereas CHD7 is involved in regulating gene activity (turning genes on and off which is needed for tumour growth). Their research suggested that by targeting these proteins, they could slow down or even halt the progression of a proportion of these tumours, opening up a new avenue of research into this disease.

The team went on to demonstrate in 2021 that a naturally occurring compound known as inositol hexaphosphate (IP6), present in many plant sources and in certain high-fibre diets, such as cereals and legumes, significantly slows the growth of group 4 medulloblastoma. It works by disrupting the tumour's energy supply through an interaction with BMI1 and CHD7. This breakthrough meant that the researchers could essentially starve cancer cells, preventing their growth. In the same study it was demonstrated that combining IP6 with cisplatin, a traditional chemotherapy used for medulloblastoma tumours, yielded promising results, suggesting the potential for a new combination therapy for patients.

By 2022, the research had advanced further. They started to explore the effectiveness of combining drugs that directly target BMI1 with those that target an associated pathway known as MAPK/ERK. This approach showed remarkable success, demonstrating significantly extended survival in preclinical models, while sparing non-cancer cells in the brain, suggesting a promising non-toxic treatment option for children with group 4 medulloblastoma.

Each discovery has built upon the last and not only has the potential to extend the lives of children with medulloblastoma, but also to improve the quality of life for patients through more targeted and less toxic treatments. In the coming years, the research team will be collaborating with national and international research groups and clinical networks to quickly and effectively bring their discoveries to patients.

They are also expanding their research to understand if the deregulation of BMI1 and CHD7 is present in other paediatric tumours, to help even more children with aggressive brain tumours.

FACT FILE

Medulloblastoma is the most common high-grade brain tumour in children, originating at the back of the brain in the cerebellum or posterior fossa. It is classified into four groups: WNT, SHH, group 3, and group 4, each with distinct genetic and clinical characteristics. Current treatments include surgery, chemotherapy and radiotherapy, but they often result in significant long-term side effects, highlighting the need for more targeted and less toxic therapies.

Patient case study: OLLIE GARDNER

Peter Gardiner lost his eldest son, aged 13, to a medulloblastoma. In Ollie's memory, his family has donated more than £200,000 to our Centre of Excellence at Queen Mary, sponsoring Dr Sara Badodi, whose work focuses on medulloblastoma. Peter said:

"It still haunts me seven years on, that, despite all our desperate searching, we failed to find an effective treatment that could save our son. Knowing that Ollie's legacy is helping push forward the search for a brain tumour cure is some comfort. There is still so much to learn and understand about this devastating disease, but the research is so terribly underfunded."

TRANSFORMING DIAGNOSIS AND MONITORING

Going for scans and waiting for the results is an incredibly worrying time for brain tumour patients, either at initial diagnosis or during their brain tumour journey and the monitoring of tumour progression. Scanxiety can have a major impact on patient's lives and significantly affect quality of life.

Brain Tumour Research is dedicated to funding innovative research into non-invasive and cost-effective techniques for diagnosing and monitoring brain tumours. By providing new ways to diagnose tumours without invasive biopsies or advancing MRI scans to more accurately pinpoint tumour progression, the Charity hopes to improve outcomes for brain tumour patients by avoiding delays in diagnosis and access to treatments.

CAN WE DIAGNOSE BRAIN TUMOURS THROUGH A BLOOD TEST?[33]

Dr Nelofer Syed, Mr Kevin O'Neill *and* **Mr Giulio Anichini** *at the Brain Tumour Research Centre of Excellence at Imperial College London*

In a game-changing clinical trial, our researchers at the Brain Tumour Research Centre of Excellence at Imperial College London have demonstrated that high-grade brain tumours, such as glioblastoma and astrocytoma, can be accurately detected by a simple blood test.

Getting a prompt and accurate diagnosis is critical for patients with high-grade brain tumours, who need to start their treatment as soon as possible to improve outcomes. Traditionally, diagnosis requires invasive brain surgery to remove part of the tumour (performing a biopsy) for assessment. Brain surgery carries high risks, including pain, bleeding, brain swelling, infections, and even death. Surgery is impossible for some tumours because of their diffuse nature or location in inaccessible brain areas.

The clinical trial that took place at the Brain Tumour Research Centre of Excellence at Imperial College London and Imperial College Healthcare NHS Trust, in partnership with Datar Cancer Genetics, proved the accuracy and specificity of a blood test that detects the presence of high-grade glial brain tumours from cancerous cells circulating in the blood. The test was shown to successfully detect multiple grades and subtypes, including gliomas, astrocytomas, oligodendrogliomas and glioblastoma.

A blood test that can accurately detect high-grade tumours is an exciting advancement. It could mean that many people with symptoms of a brain tumour or evidence of a mass in the brain may not need surgery to determine tumour presence and type. Instead, they could be diagnosed with a blood test, reducing their risk of complications, saving resources and money, and avoiding delays in diagnosis and treatment access.

The work at the Centre attracted international recognition and in 2023 the blood test was granted 'Breakthrough Device Designation' by the US Food and Drug Administration (FDA). The hope is now for a larger clinical study in the UK. If successful, patients with suspected high-grade tumours could benefit from this breakthrough within two years.

Dr Syed said: *"A non-invasive, inexpensive method for the early detection of brain tumours is critical for improvements in patient care. There is still some way to go, but this solution could help people where a brain biopsy or surgical resection of the tumour is not possible due to the location of the tumour or other constraints. Through this technology, a diagnosis of inaccessible tumours can become possible through a risk-free and patient-friendly blood test. We believe this could be a world-first as there are currently no non-invasive or non-radiological tests for this type of tumour."*

CAN WE DIAGNOSE BRAIN TUMOUR GRADES THROUGH IMAGING?[34]

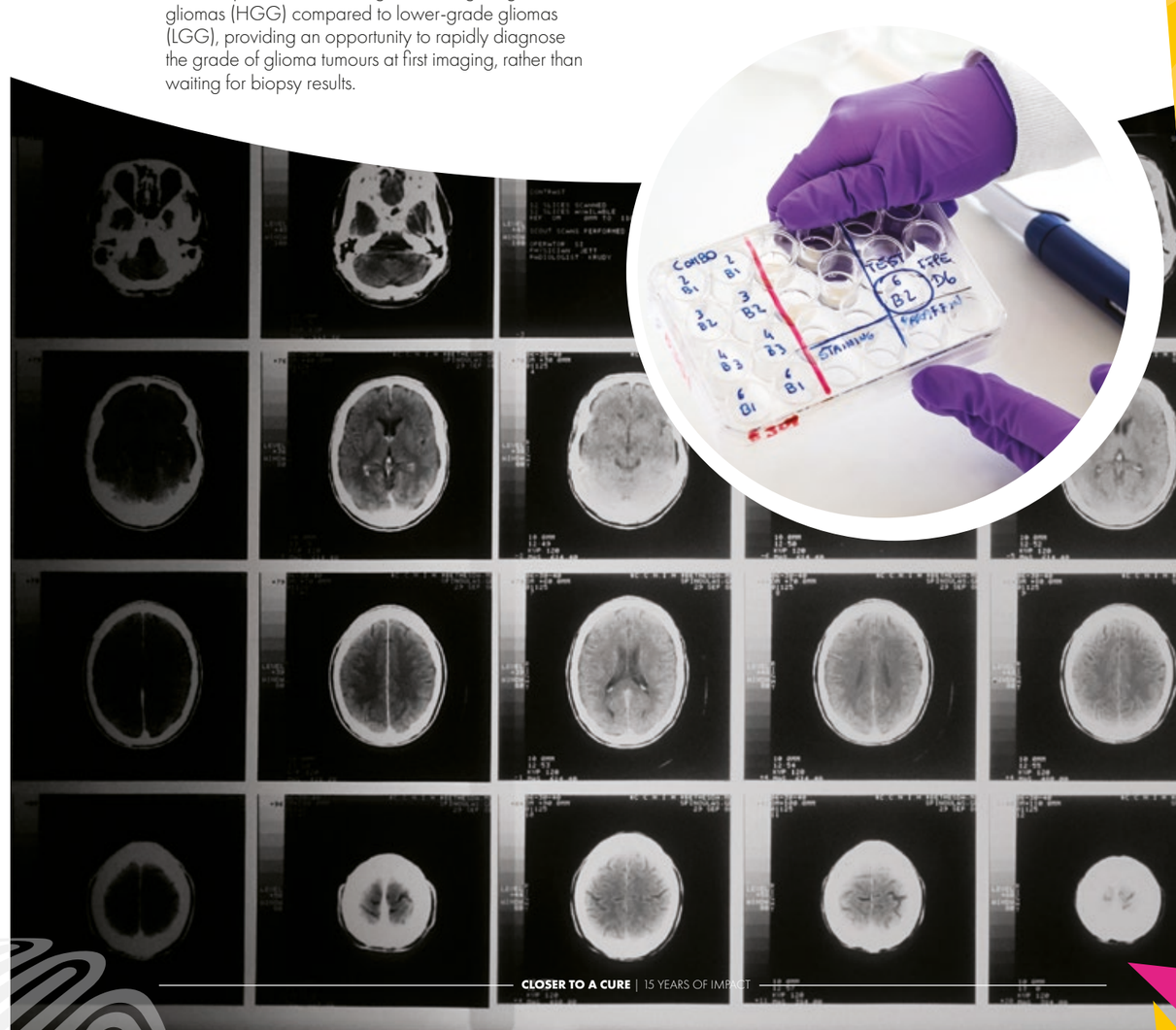
Mr Kevin O'Neill, *Principal Investigator at the Brain Tumour Research Centre of Excellence at Imperial College London*

Researchers, funded by Brain Tumour Research, have been working with Professor Eric Aboagye, Professor of Cancer Pharmacology and Molecular Imaging in the Department of Surgery and Cancer, Imperial College, to improve the imaging of brain tumours.

In research published in 2023, the team explored the use of a chemical known as [18F]fluoropivalate (FPIA) to enhance standard PET/MRI for imaging brain tumours. Conducted on 10 adult glioma patients, the study found that the uptake of FPIA was greater in higher-grade gliomas (HGG) compared to lower-grade gliomas (LGG), providing an opportunity to rapidly diagnose the grade of glioma tumours at first imaging, rather than waiting for biopsy results.

This new imaging technique could aid accurate diagnosis and treatment planning prior to biopsy surgery and could significantly enhance patient outcomes by enabling better discrimination between tumour grades, leading to more targeted surgical interventions and therapies.

This advancement represents a promising step forward in brain tumour imaging, potentially transforming clinical practices and improving survival rates for patients with gliomas.



THE POWER OF LEVERAGED FUNDING

The Charity's dedication to campaigning has successfully influenced the national investment for research into brain tumours. This success is further amplified by the Charity's funding model, which has enabled its Centres of Excellence to attract significant additional investment from other sources.

To date, Brain Tumour Research has awarded £18.2 million to its Centres, with an additional £23.2 million leveraged by the Centres themselves. By successfully securing funding from other sources, the Research Centres are empowered to expand their research projects, attract high-calibre researchers, and achieve game-changing advancements in brain tumour research.

Total amount we've awarded to research (Centres and other activities): £23.2 million

Our awards plus additional funding the Research Centres have leveraged: £46.4 million

SUCCESS STORY:

BARTS BRAIN TUMOUR CENTRE AT QUEEN MARY UNIVERSITY OF LONDON IN PARTNERSHIP WITH BARTS HEALTH NHS TRUST

Professor Silvia Marino, Director of the Brain Tumour Research Centre of Excellence at Queen Mary University of London

In 2014, Brain Tumour Research partnered with Professor Marino to establish the Brain Tumour Research Centre of Excellence at Queen Mary University of London with the aim of furthering our understanding of glioblastoma tumours and bringing us closer to personalised treatment for patients. However, despite Queen Mary's connections with Barts Health NHS Trust, when the Centre first launched there were no clinical trials available for brain tumour patients.

Leveraging our initial investment of £2.5 million, Professor Marino, in partnership with Dr Rachel Lewis, Clinical Oncologist, and Mr Edward McKintosh, Neurosurgeon, secured matched funding of an additional £1.7 million from Barts Charity to develop a clinical research infrastructure in neuro-oncology at Barts Health NHS Trust, and thus form the Barts Brain Tumour Centre to complement the Brain Tumour Research Centre which is focused on biological research.

Today, the Barts Brain Tumour Centre has significantly enhanced the clinical research in neuro-oncology taking place locally and has increased the availability of experimental treatments for patients. In 2021, and again in 2024, the Barts Brain Tumour Centre was recognised as a Tessa Jowell Centre of Excellence, and remarkably from having no clinical trials in 2019, the Centre was acknowledged to be running the most brain tumour clinical trials in one neuro-oncology centre in the UK in 2024 (12 studies open to recruitment). There is also the ambition to open a stereotactic radiotherapy study initiated at Barts in the near future.

The Charity is proud to have provided the seed funding for this vital infrastructure and has always been clear on its aim to stimulate further research by attracting new funders. Professor Marino said: *"To be able to build on the foundations established by Brain Tumour Research enables us not just to continue but to grow our research capabilities and invest more resources into finding answers to questions about how tumours develop and what new drugs we can discover to stop them. It's an exciting time and will allow us to move faster from the bench to the bedside, offering more experimental treatments to patients."*

RESOURCES FOR RESEARCHERS

Brain Tumour Research believes that providing the necessary infrastructure for researchers is crucial to advancing our understanding and treatment of brain tumours. The Charity is committed to funding and supporting initiatives such as BRAIN UK, a virtual tissue bank which offers invaluable resources by cataloguing and managing tumour tissue samples, and initiatives such as the Brain Tumour Research Novel Therapeutics Accelerator (BTR-NTA), which provides multidisciplinary expert feedback to support researchers developing novel therapies for brain tumours globally.

By investing in these essential resources, the Charity is helping to create a robust foundation for innovative research, bringing us closer to finding a cure for brain tumours.

ACTING AS MATCHMAKER[35]

Professor Delphine Boche, *Director of BRAIN UK, University of Southampton*

BRAIN UK is a virtual tissue bank that has been transforming research into brain tumours by providing unparalleled access to an extensive collection of brain tissue samples.

Brain Tumour Research recognised the value of this work in enabling researchers to access brain tumour samples and has been funding BRAIN UK since 2013.

With a centralised database cataloguing over 210,000 biopsy and post-mortem cases, including brain tumour, BRAIN UK acts as a matchmaker, connecting researchers with invaluable tissue samples to progress their research. They have made it possible for scientists to access a wealth of data that was previously out of reach and have been instrumental in advancing the understanding of brain tumours.

When someone is diagnosed with a brain tumour, they are referred to one of the 24 NHS Neuropathology centres for specialist care. Experts use advanced imaging techniques to locate the tumour, and a neurosurgeon performs a biopsy to obtain a sample. This tissue is then meticulously examined by a neuropathologist to determine the tumour type, guiding the appropriate treatment. Any remaining tissue is stored according to national guidelines, contributing to an extensive archive of samples.

Since its inception, BRAIN UK has supported over 110 tumour studies, providing more than 26,000 samples to researchers. The impact of this support is profound, with 148 publications generated from BRAIN UK studies to date, and published in prestigious journals like *Nature* and *The Lancet*. One reported publication contributed to the creation of a new chapter in the 2021 WHO classification of brain tumours.

By successfully engaging with 22 of the regional Neuropathology Centres, BRAIN UK has created a network that spans the UK, covering the neurological conditions affecting the UK population, ensuring that researchers have access to the tissue samples they need. This initiative has not only accelerated the pace of research but also enhanced the quality of studies, leading to breakthroughs in our understanding of brain tumours and their treatment.

As molecular techniques and technological advances continue to develop, the importance of BRAIN UK will only grow. By providing researchers with easy access to a vast repository of brain tumour samples, BRAIN UK is paving the way for innovative studies that will lead to better treatments and, ultimately, a cure for brain tumours.

BRAIN UK was established in 2009 by the collaborative efforts of Professor James Nicoll from the University of Southampton and Dr David Hilton from Plymouth Hospitals NHS Trust. At that time, funded by the Medical Research Council and supported by the British Neuropathological Society, the tissue bank focused on post-mortem cases. However, in 2014, the project expanded to include tissue samples from living patients (biopsies), thanks to a collaboration with Professor Kathreena Kurian from the University of Bristol and support from our Member Charities brainstrust and Charlie's Challenge, our Fundraising Group, Sophie's Wish, along with other brain tumour charities and funding bodies.

PROVIDING CELLS TO ACCELERATE RESEARCH

Professor Oliver Hanemann, *Director of the Brain Tumour Research Centre of Excellence at the University of Plymouth*

Funded by Brain Tumour Research, the University of Plymouth biobank has been a crucial resource for researchers investigating low-grade brain tumours such as meningioma and schwannoma. The biobank, located at our Centre of Excellence at Plymouth, collects and stores biological samples from brain tumour patients and includes tumour tissue, blood, plasma, and blood serum. Uniquely, each sample is linked to comprehensive clinical and genomic data, creating a rich repository for research.

The samples come from patients who have said they would like to support research at the North Bristol NHS Trust and University Hospitals Plymouth NHS Trust, and they are collected with the help of nurse practitioners and the support of Dr David Hilton's and Dr Shivane's team in Plymouth, and Professor Kathreena Kurian's team in Bristol.

Researchers at the University of Plymouth and external collaborators have used the biobank to study tumour biology, genetics, and treatment responses, and it has had a vital role in the development of new treatments and therapies for low-grade brain tumour patients.

BRAIN TUMOUR RESEARCH NOVEL THERAPEUTICS ACCELERATOR

Brain Tumour Research in partnership with the Tessa Jowell Brain Cancer Mission

Since its launch in 2023, the Brain Tumour Research Novel Therapeutics Accelerator (BTR-NTA) has provided crucial support to academic and industry researchers working on the research and development of potential therapies for patients with a brain tumour.

Funded by Brain Tumour Research, in partnership with the Tessa Jowell Brain Cancer Mission, the BTR-NTA programme has provided invaluable expert guidance to research groups, with the aim of helping to navigate the complex path to clinical trials.

To date, the programme has reviewed 23 novel therapies, with 11 receiving a comprehensive in-person review and feedback to help with refining the future direction of their research programme.

> ***"Genuinely designed to improve ideas for fundamental discoveries and translation to the clinic."***

A variety of therapeutic strategies has been reviewed by the BTR-NTA Committee to date, ranging from implantable devices to immune therapies and small molecule drugs. Research projects have received up to 240 hours of bespoke feedback designed to identify potential pitfalls and risks which may have prevented future translation into patient benefit.

A previous applicant to the BTR-NTA programme said: *"The programme provided a way for a small startup like us to interact with leading experts in the field and let us ask pertinent and important questions regarding various aspects of our device."*

The BTR-NTA's impact is evident in the feedback from both participants and committee members, with 86% of applicants stating the BTR-NTA process provided new insights or ideas they had not previously considered. It is hoped that the programme will see more therapies enter human trials, more research focused on drug discovery, improved relationships with industry and academia, and the de-risking of trials.

> ***"The BTR-NTA programme has provided an amazing opportunity to get feedback on the strengths and weaknesses of our project. This will help us move the project forward from the preclinical proof-of-concept phase towards clinical translation."***

OVERCOMING THE BLOOD-BRAIN BARRIER[36]

Emeritus Professor Geoff Pilkington, *Director of the former Brain Tumour Research Centre of Excellence at the University of Portsmouth*

In 2010, Brain Tumour Research established its first dedicated Centre of Excellence at the University of Portsmouth. Led by Professor Geoff Pilkington until his retirement in 2018, the Centre worked to develop and test treatments for all types of brain tumours, both adult and paediatric. In 2016, it was the largest dedicated brain tumour research centre in the UK.

As part of their sizeable research programme, and partly funded by Animal Free Research UK, researchers at the Centre developed an innovative, animal-free model of the blood-brain barrier (BBB) using human cells. Published in 2018, the all-human model was designed to reduce the reliance on animal models in the laboratory and provide a more accurate indication of how drugs are likely to act in a human brain, therefore increasing the likelihood of successful clinical trials for all types of brain tumours.

The BBB is a natural protective membrane that prevents harmful substances from entering the brain while allowing essential nutrients to pass through. It is made up of a number of different types of cells, including endothelial cells (which line blood vessels), astrocytes (a type of brain cell) and pericytes (cells that wrap around blood vessels). These cells work together to maintain the barrier's integrity, but as a consequence, they prevent the entry of most medicines into the brain, making it very difficult to treat certain conditions and diseases, including brain tumours.

The majority of research laboratories use animal cells to study how drugs can pass through the BBB; however, these do not fully mimic the human brain, which makes it difficult to apply the results to patients. To overcome this, scientists at Portsmouth developed a reliable and reproducible lab-based 3D model of the BBB, using human brain endothelial cells, astrocytes and pericytes derived from patients who had undergone brain surgery. They demonstrated that using multiple cell types together strengthens the barrier, making it more effective for studying drug delivery and cancer metastasis. They also identified that key proteins, such as perlecan and agrin, are crucial for maintaining the barrier's integrity.

Accurate models are essential in driving forward the progress of research into brain tumours. The model developed at Portsmouth is not only helping researchers around the world study how drugs and other substances cross the BBB, improving drug delivery, but is also helping to further our understanding of the mechanisms by which cancer cells metastasise to the brain.

GROWING CAPACITY IN THE RESEARCH FIELD

Brain Tumour Research is proud of the game-changing work achieved at its Centres of Excellence. Through the long-term funding partnerships providing by the Centre of Excellence investment model, researchers can dedicate themselves to continuous research without the constant need to apply for individual grants. This stability not only allows scientists to advance their careers within the brain tumour research field but also fosters expertise and collaboration across a network of interconnected Centres.

By building a critical mass of exceptional researchers, this approach supports long-term research plans aimed at finding a cure. Additionally, long-term funding enables Centres to attract, recruit, and train promising researchers who might otherwise pursue other specialisms, providing them with job security and encouraging high-calibre research personnel to join the fight against brain tumours.

CELEBRATING OUR OUTSTANDING RESEARCHERS

At each institution, researchers are progressing in their careers, setting up their own research groups and getting us closer to a cure for all types of brain tumours.

SARA BADODI

Dr Sara Badodi is a dedicated researcher at the Brain Tumour Research Centre of Excellence at Queen Mary University of London. Her research focus is paediatric brain tumours, specifically medulloblastoma and paediatric high-grade glioma, which are the most common high-grade paediatric brain tumours.

Dr Badodi studies the mechanisms regulating DNA modifications that play a role in the development and maintenance of paediatric tumours. Her goal is to exploit this knowledge to target tumour cells while preserving healthy brain tissue.

Her research was funded by a generous donation from the family of Ollie Gardiner, who passed away from medulloblastoma in 2017. This funding allowed Dr Badodi to establish herself as a researcher and progress into a Junior Principal Investigator at Queen Mary, where she is now setting up her own laboratory group.

Dr Badodi said, *"The funding from Brain Tumour Research and Ollie's family allowed me to continue a research career in the brain tumour field, one of the most challenging scientific areas of research. Thanks to this funding I was able to publish groundbreaking results in medulloblastoma, the most common aggressive paediatric brain tumour, and collect compelling data that allowed me to design the project that I will now develop as a Junior PI"*

GIULIO ANICHINI

Dr Giulio Anichini is a Neuro-Surgical Research Fellow at the Brain Tumour Research Centre of Excellence at Imperial College London. His research is focused on pioneering new approaches to make surgery safer while removing as much tumour as possible.

During his time at the Imperial Centre, Dr Anichini completed his PhD on tumour visualisation and went on to become a Fellow of the Royal College of Surgeons, significant milestones in his career to become a clinical academic.

Dr Anichini has been involved in multiple collaborations with researchers and clinicians throughout the UK and his work is part of a broader effort to translate scientific findings into clinical practice, ultimately improving outcomes for patients with brain tumours.

RICHARD PERRYMAN

Dr Richard Perryman is a Brain Tumour Research-funded Research Associate working at our Imperial College Centre of Excellence. He completed his PhD funded by the Medical Research Council and works alongside Dr Nelofer Syed on cancer cell metabolism and response to chemotherapy.

Part of Dr Perryman's research focuses on the non-invasive measurement of metabolites in brain tumours using MRI. He hopes that this technique will be used in clinical trials for patients with glioblastoma, allowing for the non-invasive monitoring of their response using MRI.

Dr Perryman said, *"Funding from Brain Tumour Research was critical in establishing myself as a post-doctoral research associate following the completion of my PhD at Imperial College London. It has allowed me the freedom to work on multiple projects within the group, and grow my skills as a researcher."*

LIYAM LARABA

Dr Liyam Laraba is a Research Fellow at the Brain Tumour Research Centre of Excellence at the University of Plymouth. He is a member of Professor David Parkinson's team, focusing on meningioma and schwannoma tumours, which are both related to the loss of NF2, a tumour-suppressor gene.

Dr Laraba completed his PhD through a Brain Tumour Research studentship and has been recognised with the Distinguished Young Investigator Research Award at the 2nd Annual Neurofibromatosis Young Investigators Forum in Houston, USA, 2023.

His work primarily involves investigating treatments for NF2-related tumours, specifically schwannoma tumours. In 2024, Dr Laraba was awarded a significant grant from the Children's Tumor Foundation, the first for Dr Laraba as Principal Investigator, and the first step in becoming an independent researcher and founding his own research laboratory.

Dr Laraba reflects that *"My Brain Tumour Research PhD studentship funding was a massive springboard for my career in research into brain tumours. The Centre of Excellence model that Brain Tumour Research champions has provided me with invaluable opportunities to generate preliminary data that has enabled me to make impactful publications and be competitive for ambitious project funding calls. I look forward to continued work alongside Brain Tumour Research to drive new preclinical discoveries for meningioma and schwannoma tumours."*

JON GIL-RANEDO

Dr Jon Gil-Ranedo has been a Research Fellow and now is a Lecturer at the Brain Tumour Research Centre of Excellence at the University of Plymouth. He is a member of Dr Barros's team and works on molecular mechanisms driving brain tumour initiation and growth, focusing on glioma, a type of brain tumour that develops from stem-like cells, which are naturally resistant to therapy.

After being supported by Brain Tumour Research as Research Fellow within Claudia Barros' group since 2018, Dr Gil-Ranedo was awarded tenure by Plymouth University in 2024, not only recognising the impact of his research but allowing him to take the first steps to becoming an independent researcher.

Dr Gil-Ranedo said, *"The generous funding received from Brain Tumour Research, and the support from Dr Barros and Prof Hanemann, have been key in my career progression, allowing me to focus on my research at University of Plymouth and ultimately achieve a tenured position."*

CLAIRE DOBINSON

Claire Dobinson is a Senior Scientific Officer at the Brain Tumour Research Centre of Excellence at The Institute of Cancer Research (ICR). Her work is focused on paediatric type diffuse high-grade gliomas, and her expertise in research models is essential to the preclinical work taking place at the Centre.

Initially employed to provide expertise for all research laboratories at ICR, Claire's appointment to the paediatric glioma team is crucial to advancing cancer treatments for paediatric brain tumour patients by characterising, monitoring and collecting data on cancer development and the effects of therapies.

Her work helps provide a comprehensive understanding of cancer biology, which is essential for developing new treatments.

Claire said, *"It is a privilege and an honour to be receiving this funding from the Centre of Excellence. Being a mother myself, I feel a huge amount of responsibility knowing that I'm contributing towards finding treatment for children and young adults. The amount of sacrifice that has been made by families to provide this funding humbles me. They are heroes - and our role is to ensure that we fight for them."*

REBECCA ROGERS

Dr Rebecca Rogers is a Senior Scientific Officer at the Brain Tumour Research Centre of Excellence at The Institute of Cancer Research ICR. Her primary focus is to find new treatment options for paediatric high-grade gliomas, including diffuse intrinsic pontine glioma which is a highly aggressive brain tumour that arises in the pons region of the brainstem.

Dr Rogers leads the target validation work within the Centre, specifically focusing on ACVR1 drug combination projects. She presented an abstract on one of these projects at the Society for Neuro-Oncology Paediatric Conference in June 2023, where she won the Paediatric Basic Science Prize for best abstract.

Dr Rogers said, *"I am continually inspired by the families and charities that help fund our research, it's their dedication that motivates me every day to keep pushing forward with experiments to help identify new treatment options with the hope of changing the outcomes for children diagnosed with high-grade glioma."*

ATTRACTING EXPERTS FROM OTHER DISCIPLINES

Attracting scientists from diverse research disciplines into research into brain tumours is essential for achieving our vision of finding a cure.

Brain tumours are numerous and complex, and they require a multidisciplinary approach to fully understand their growth and progression and develop innovative treatments. By providing the resources to bring together knowledge from genetics, immunology, bioinformatics, and engineering, Brain Tumour Research is creating a collaborative environment that sparks game-changing discoveries and quickly turns them into real-world applications.

With the sustained funding from a Centre of Excellence award, research teams can attract personnel who might not otherwise focus on brain tumours. This is achieved through co-supervision of PhD students, matched and leveraged funding, and the creation of new Research Fellow positions that require their unique expertise.

GARY NEWTON
MEDICINAL CHEMISTRY

Dr Gary Newton is a Group Leader in Medicinal Chemistry at ICR, where he applies his extensive experience in medicinal chemistry to validate new targets and develop effective medicines for the treatment of cancer.

By supervising a Brain Tumour Research Funded PhD student, Dr Newton is turning his attention and expertise to paediatric high-grade glioma (PDHGG), a particularly aggressive form of brain cancer in children. This shift highlights his commitment to addressing some of the most challenging and urgent needs in cancer research.

Dr Newton said, *"The newly funded Centre of Excellence is acting as a focal point to bring together different disciplines within the ICR to tackle PDHGG. I work in the Centre for Cancer Drug Discovery at the ICR. This is a translational arm of the ICR which consists of expert teams of drug discovery scientists with experience in both academia and industry. Our aim is to translate the exciting research discoveries made at the ICR into new medicines. Thanks to this Centre of Excellence award, we have established a PhD studentship to explore a novel set of dependencies in PDHGG with Prof Chris Jones's team. This award is also acting as a stepping stone on which to build a broader collaboration between our division and those scientists at the ICR with strong disease expertise in PDHGG."*

GABRIELA KRAMER-MAREK
PRECLINICAL MOLECULAR IMAGING

Dr Gabriela Kramer-Marek is a Group Leader at ICR, where she heads the Preclinical Molecular Imaging team. Her research focuses on developing new ways of molecular imaging to predict how patients will respond to treatments.

Having previously worked on adult glioblastoma tumours by supervising a PhD student funded by the Centre of Excellence Award at ICR, Dr Kramer-Marek's expertise has been turned to paediatric diffuse high-grade gliomas (PDHGG)

Dr Kramer-Marek said, *"Your financial support will provide the opportunity to apply my expertise and this promising treatment to the study of childhood brain tumours for the first time.*

By enhancing our understanding and application of this technology, we can better tailor treatment to the unique challenges of PDHGG, minimise harm to surrounding healthy tissues, and ultimately improve survival rates while reducing treatment-related morbidities."

MAHMOUD LABIB
BIOTECHNOLOGY

Dr Mahmoud Labib is a Lecturer with a proven track record in the development of cancer diagnostics and therapeutics. Having joined the Centre of Excellence at the University of Plymouth in 2023 from Northwestern University in the US, Dr Labib is establishing a laboratory dedicated to identifying the druggable genetic regulators of immunosuppression occurring in glioma tumours, which contribute to their growth.

As part of his work within the Centre of Excellence, Dr Labib is also actively engaged in identifying key genes associated with non-small cell lung cancer spreading to the brain, with the aim of developing new diagnostics and therapeutics.

BEN NEWLAND
BIOMATERIALS

Dr Ben Newland is a Lecturer at the School of Pharmacy and Pharmaceutical Sciences at Cardiff University. He leads the Materials for Neuroscience research group, focusing on creating soft, implantable biomaterials for delivering drugs and other therapeutics to the brain.

Initially focused on Parkinson's Disease, Dr Newland was attracted to research into brain tumours by a unique project co-funded by the Medical Research Council and Brain Tumour Research. His project involves developing a surgically implanted drug-delivery system for glioblastoma patients, aiming to reduce off-target side effects and improve treatment efficacy.

DAN ELSON
SURGICAL IMAGING

Dan Elson is a Professor of Surgical Imaging and Biophotonics at Imperial College London and a Co-Investigator at the Brain Tumour Research Centre of Excellence at Imperial College London. He is based in the Hamlyn Centre for Robotic Surgery, Institute of Global Health Innovation, and the Department of Surgery and Cancer at St Mary's Hospital. His research focuses on developing and applying advanced photonics technology for medical imaging, particularly in minimally invasive and robotic-assisted surgery.

Professor Elson has worked closely with our Imperial College clinical team for many years providing expertise on multispectral imaging, a technique to enhance surgical precision and improve the accuracy of brain tumour resection. He formally joined the Centre in early 2024 to lead on our novel visualisation project.

SINDHUJA SRIDHARAN
SYSTEMS BIOCHEMIST

In 2022, Dr Sindhuja Sridharan joined the Centre of Excellence at Queen Mary University of London as a Junior Principal Investigator, funded by Barts Charity as part of the Barts Brain Tumour Centre funding.

Dr Sridharan is a systems biochemist with a keen interest in understanding how changes in protein networks within cells affect health and disease. She is now turning her expertise to brain tumours as a result of this new Junior Principal Investigator post and co-supervises PhD students within the Centre focused on glioblastoma.

In 2023, she secured a prestigious Royal Society seed grant to kick start her research on systems proteomics in glioblastoma.

RADU ZABET
COMPUTATIONAL BIOLOGY

Dr Radu Zabet is a Senior Lecturer in Computational Biology at the Blizard Institute, Queen Mary University of London. He leads a research group that uses computer models and experiments to understand how genes are regulated and how they interact with each other and their environment.

Dr Zabet had not worked on brain tumours before; however, he was attracted to the field through the co-supervision of Brain Tumour Research-funded PhD students. He is now Co-Investigator at the Centre of Excellence at Queen Mary, providing expertise to facilitate research into glioblastoma.

BRINGING TOGETHER RESEARCHERS – THE BRAIN TUMOUR RESEARCH ANNUAL RESEARCHER WORKSHOP

Brain Tumour Research hosts an annual researcher workshop which brings together all the supported research personnel from the Charity's Research Centres and Funded Initiatives. These lively two-day events provide an opportunity to highlight the Charity's research portfolio and are a vital platform for networking and sharing ideas.

First held in 2017, the workshops have brought together over 350 research personnel at events held throughout the UK. Although impacted briefly by COVID19, Brain Tumour Research has held seven events, and each year they get bigger and bigger. The workshops have:

Increased collaboration and networking – a vital platform for researchers to share findings, discuss innovative approaches, and foster collaborations, they have helped build a strong, interconnected research community among our supported research personnel.

Supported early career researchers – PhD students and early postdoctoral researchers are provided with a welcoming community and an opportunity to present their research to others, enhancing the likelihood of their continued involvement in research into brain tumours.

Celebrated scientific progress – providing opportunities to share updates on projects and progress and celebrate the dedication and commitment of scientists at various stages of their careers.

Strengthened the connection between researchers and the Charity – an opportunity for the Charity to report on its achievements, collaborations, and strategic direction, strengthening the connection between researchers and the Charity.

Encouraged engagement in fundraising and campaigning – furthering the relationship of researchers with the Charity.

FOSTERING COLLABORATION

Collaboration is essential to accelerating progress in research. By working in partnership with other charities and government organisations, Brain Tumour Research can amplify its efforts, share resources, and drive transformational changes that benefit patients and their families.

The importance of such partnerships is exemplified through recent collaborations, which have led to strategic funding partnerships, innovative advancements and impactful research.

PARTNERING WITH THE MEDICAL RESEARCH COUNCIL

Dr Ben Newland, *Principal Investigator, Cardiff University*

The strategic partnership between Brain Tumour Research and the Medical Research Council (MRC) is a landmark collaboration, marking the Charity's first engagement with a Government funder and its first major investment in Wales. The £500,000 project, led by Dr Ben Newland and located at Cardiff University, focuses on developing a novel surgically-implanted drug delivery system for glioblastoma patients. The innovative approach aims to enhance treatment efficacy and reduce side effects by delivering cancer therapeutics directly to the tumour site. This collaboration represents a significant step forward in advancing research into brain tumours and improving patient outcomes.

Dr Karen Noble, Director of Research, Policy and Innovation, Brain Tumour Research, said: *"We are delighted to be able to support the pioneering work of Dr Newland and his team. We share his excitement on undertaking this challenge, which is our first such partnership with the MRC and the Charity's first major investment in Wales.*

Developing a way to deliver therapeutics intraoperatively presents a remarkable opportunity to progress care for brain tumour patients and potentially reduce the incidence of tumour recurrence.

Brain tumour patients have waited too long for an improvement in treatment options, and we are very excited by this research into novel drug delivery as it is the route to improving the dreadful statistics associated with this devastating disease."

COLLABORATING WITH OTHER CHARITIES TO ADDRESS UNMET NEEDS IN GLIOBLASTOMA CARE[37]

Dr Karen Noble, *Director for Research Policy and Innovation, Brain Tumour Research*

Our involvement in a research paper on the unmet needs of glioblastoma patients in the UK highlights the critical role of collaboration in understanding and addressing patient challenges. By partnering with patient advocacy charities, Brain Tumour Research contributed to a study published in *Neuro-Oncology Practice,* which called for a holistic approach to glioblastoma treatment. The findings of the report emphasised the need for improved support, better communication among healthcare professionals, and increased access to clinical trials and new treatments. The findings were discussed at a pivotal workshop, hosted by Novocure, at the European Association of Neuro-Oncology annual meeting in Glasgow, 2024. Dr Noble, was invited to speak at the event about the challenges patients face in accessing clinical trials and treatments.

WORKING TOGETHER TO OVERCOME BARRIERS TO RESEARCH[38]

Dr Karen Noble, *Director for Research Policy and Innovation, Brain Tumour Research*

In 2023, Brain Tumour Research, a member of the UK National Cancer Research Institute (NCRI) Brain Group, worked in collaboration with others to publish an impactful paper highlighting the barriers and opportunities for the brain tumour research sector in the UK to accelerate progress for adult patients across the world.

The NCRI Brain Group used expert sessions and reports from Cancer Research UK, the National Institute for Health and Care Research (NIHR), and the All-Party Parliamentary Group on Brain Tumours (APPGBT) to investigate the research landscape.

Dr Noble is a named author of the position paper which identifies three key themes, including collaboration, funding and training, and seven priorities such as preclinical models and assays and better clinical trials.

Dr Noble said, *"The recommendations made in this position paper are designed to inspire UK reform and provide focal points for future funding calls and partnerships, to accelerate progress towards better and longer life for adult brain tumour patients across the world."*

CHANGING THE STORY FOR BRAIN TUMOUR PATIENTS IN SCOTLAND

Brain Tumour Research in collaboration with the Beatson Cancer Charity

In 2024, Brain Tumour Research embarked on a game-changing collaboration with the Glasgow-based Beatson Cancer Charity to raise the funds needed to establish the Scottish Brain Tumour Research Centre of Excellence at laboratories at the University of Edinburgh and the University of Glasgow. The partnership leveraged Brain Tumour Research's extensive experience in the medical research field and Beatson Cancer Charity's strong community presence and expertise in cancer care in Scotland.

The Centre, launched in January 2025 with £2.4 million funding over five years, is the Charity's first in Scotland and harnesses the brain power of Scottish researchers to benefit brain tumour patients in Scotland and beyond.

The Centre hosts scientists from the Universities of Edinburgh and Glasgow and has brought together the largest group of world-leading brain cancer experts in the UK to accelerate research into glioblastoma. It is focused on ensuring promising new scientific discoveries progress efficiently into trials to bring patients benefit now and in the future.

Brain Tumour Research CEO, Dan Knowles, said: *"New, improved treatments for glioblastoma patients are desperately needed. At present, new discoveries and approaches are not progressing quickly enough into clinical testing in patients. The Scottish Brain Tumour Research Centre of Excellence is helping to bridge this gap, leading to pivotal preclinical proof-of-concept data to support clinical trial development for patients.*

"The Centre represents a significant investment in Scotland and complements our other Centres of Excellence at the University of Plymouth, Imperial College London, Queen Mary University of London, and The Institute of Cancer Research."

These case studies illustrate how collaboration with other charities and organisations magnifies our impact. By coming together, we are leveraging our collective strengths, driving innovation, and offering hope to countless patients and their families.

TOGETHER WE WILL FIND A CURE.

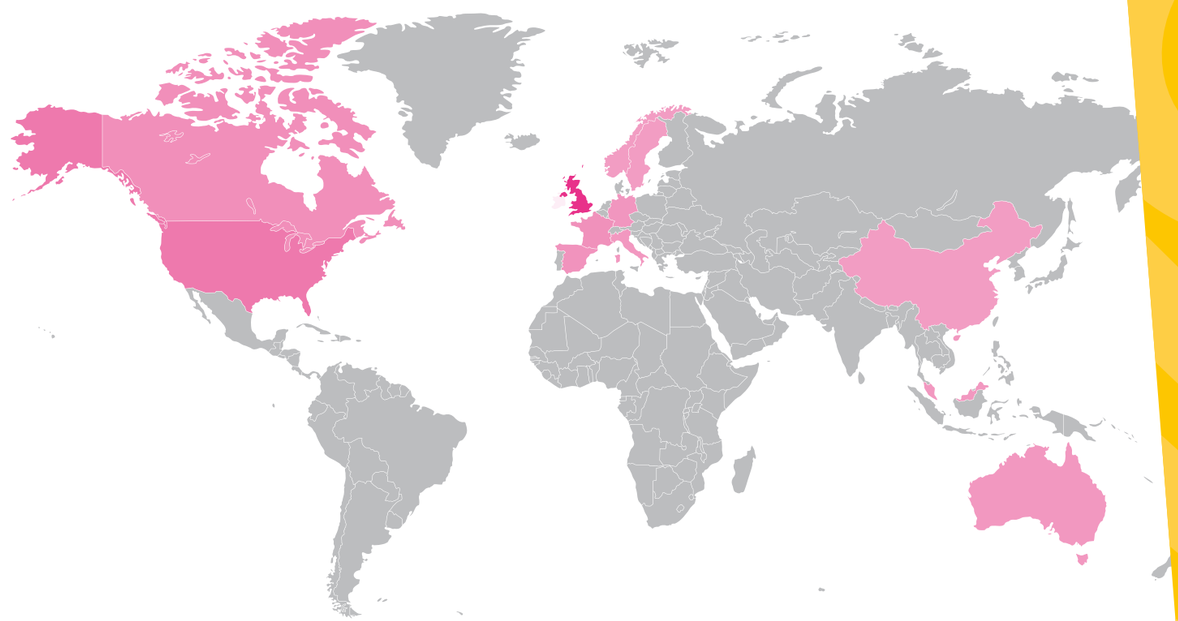
WORLDWIDE ACADEMIC COLLABORATIONS

Brain Tumour Research Centres of Excellence have collaborated with 140 different research groups worldwide, accessing expertise which has transformed research projects, opened new avenues for therapy and accelerated the Charity's mission of finding a cure for all types of brain tumours.

Working with researchers across 19 countries, Brain Tumour Research-funded scientists have delivered world-class research that has paved the way for multiple early-phase clinical trials and ensured that laboratory discoveries are being translated to patient benefit.

In addition to worldwide collaborative projects, researchers have leveraged the expertise from the internal network of Brain Tumour Research Centres of Excellence and Funded Initiatives. This indispensable network has provided valuable insights and expertise to speed up research, as well as a well-connected and supportive environment which has facilitated the growth of early career researchers into outstanding independent researchers.

WORLDWIDE COLLABORATIONS ACROSS ALL CENTRES OF EXCELLENCE



Total Collaborations Per Country

1 — 90

ENGAGING RESEARCHERS AND SUPPORTERS

Patient and Public Involvement and Engagement (PPIE) are crucial to ensure that the voices of those directly affected by brain tumours are heard and integrated into the research process. By involving patients and the public, researchers can design studies that are more relevant and impactful, addressing the real needs and concerns of the brain tumour community.

Brain Tumour Research understands that involving patients and the public in research ensures that their voices shape studies that address their real needs. It fosters collaboration, improves the relevance of research, and empowers patients. This approach bridges the gap between researchers and the community, leading to more meaningful advancements in research into brain tumours.

PATIENT RESEARCH INVOLVEMENT MOVEMENT (PRIME)[39]

Dr Helen Bulbeck, *Director of Services and Policy, brainstrust*

Since July 2022, Brain Tumour Research has partnered with brainstrust to fund PRIME, an initiative aimed at improving outcomes and opportunities for brain tumour patients by connecting them and their caregivers with researchers. PRIME has enabled patients to provide valuable perspectives to researchers to help them set up effective clinical trials. Not only has this ensured that patient needs are considered, but it has made trials more appealing to external funders.

Since its inception PRIME has been instrumental in securing over £28 million in funding for brain tumour trials

Brain Tumour Research's investment in PRIME enabled it to support more than 30 unique research projects in 2023, ranging from multinational drug trials to quality-of-life interventions.

A key example of this is the PORTRAIT study led by Dr Gerben Borst at the Christie NHS Foundation Trust in Manchester which explores how using Optune (Tumour Treating Fields) before and after surgery might improve outcomes. PRIME connected Dr Borst with patients who influenced and improved the trial design, thereby strengthening his funding application.

Over the years, PRIME has also been supported by Naseem's Manx Brain Tumour Charity and The Lazarus Legacy fund (through an in-memory donation).

Adam Thomson, Patient Involvement Officer at brainstrust, said: *"PRIME is now entering its fourth year, and as it matures so does its goals. We aim to continue and improve on our work to establish Patient and Public Involvement and Engagement as an essential and powerful tool in designing the best research projects possible and therefore giving the clinical community the best chance to make the changes we need for the brain cancer community."*

PRIME has been pivotal in bridging the gap between patients and research, ensuring that patient involvement and engagement is integral to the design of new studies, trials, and treatments. PRIME's collaboration with Brain Tumour Research has amplified its impact and together we are striving for improved outcomes for anyone impacted by a brain tumour.

VISITING THE LABORATORIES AND HEARING FROM OUR RESEARCHERS

BRAIN TUMOUR RESEARCH

Brain Tumour Research understands the importance of involving supporters in the research they are diligently working to fundraise. Since the first Research Centre launched in 2010, the Charity has worked in partnership with these Centres to host regular laboratory tours and launch events which provide supporters with an intimate glimpse into the cutting-edge research being conducted. In fact, since 2010, the Charity has invited over 1,500 patients and supporters to visit the laboratories and meet the researchers.

For researchers, lab tours have been an opportunity to showcase their work and share their passion for science with a broader audience. It has allowed them to explain the complexities of their research in a more accessible way, highlighting the innovative techniques and technologies they use. This interaction has not only boosted the morale of the scientists but has also reinforced the importance of their work, knowing that it is valued and supported by the community.

Supporters, on the other hand, have gained a first-hand look at where their donations are going and the tangible impact they are making. Walking through the laboratories, seeing the equipment, and meeting the scientists working to find a cure, brings a sense of connection and purpose. Most supporters have personal connections to brain tumour patients or family members lost to the disease, and seeing the Wall of Hope, adorned with tiles dedicated to loved ones, is a poignant reminder of why this research is so crucial. It provides a space for reflection and solidarity, strengthening the bond between the researchers and the supporters.

Patient case study:
PETER CAMPBELL

Jude Campbell lost her husband Peter to a glioblastoma in 2021. Since then, she has raised thousands of pounds to sponsor two days of research. Jude said:

"It was devastating losing my 63-year-old husband, but children are dying of brain tumours. I can only imagine what that's like and to know that so little money goes into the research is shocking. Last year, my son Lloyd and I felt lucky to be invited to Queen Mary to learn first-hand about the research being carried out into glioblastoma. We take comfort that we're helping to make a difference and bringing forward the day when people can survive this aggressive type of brain tumour."

GETTING CLOSER TO A CURE

Patron:
SARAH BEENY

"I am extremely proud to be Patron of this vitally important charity. I've watched it grow over the last decade and feel such great hope about what it will go on to achieve."

CLOSING REMARKS FROM ROB HUGHES, CHAIR OF THE TRUSTEES

I have been passionate about finding a cure for a brain tumour since 2006 when my three-year-old daughter Anna lost her battle to an ependymoma. I was dismayed then by how little was being done to find a cure or develop effective treatments. Now, 18 years later, survival rates for those diagnosed with a brain tumour remain largely unchanged, as do treatments. However, as a Trustee of the Charity over the last 13 years and now the Chair, I am optimistic about the future due to the efforts of Brain Tumour Research and other charities in increasing investment in research and raising awareness amongst the public and the government about this devastating disease and its impact.

In the beginning of the Charity's journey, it had a clear vision to 'find a cure for all types of brain tumours' with the aim of having seven Research Centres of Excellence in the United Kingdom. On behalf of Brain Tumour Research, I am proud of the progress that has been made from one Centre at the University of Portsmouth to the five Centres we have today. We have gone from our Annual Research Workshop with only 20 people attending to our most recent workshop in York, where almost 100 researchers who work across our Centres attended.

As a result, I have a real sense that the momentum is building and, looking to the future, I am excited about the potential of increased collaboration that can take place between the researchers in our Centres. I am hopeful about how those in the research community can utilise the recent developments in technology including AI to achieve step change and breakthroughs in the work they do. Given the momentum that has been achieved so far, I look forward to involvement and partnership with the pharmaceutical sector that will support our efforts and help us get closer to a cure and result in more effective treatment and better outcomes for those diagnosed with a brain tumour.

Rob Hughes,
Chair of the Trustees,
Brain Tumour Research

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