# University of Nottingham develops nanopore method to deliver brain tumour diagnoses in hours



A groundbreaking method for diagnosing brain tumours promises to drastically reduce the wait for patients needing treatment, transforming a process that currently takes weeks into one that could be completed in mere hours. Researchers from the University of Nottingham have developed this innovative technique, which leverages nanopore technology to enable quicker, more accurate diagnostic results.

Globally, around 740,000 individuals are diagnosed with a brain tumour each year, with approximately 50% classified as non-cancerous. Traditional diagnostic pathways involve taking a tumour sample during surgery, which is then studied by pathologists before being subjected to genetic testing. This crucial process often incurs significant delays, especially in the UK, where the wait for genetic testing results can extend to eight weeks or more. Professor Matthew Loose, co-author of the research, emphasised the critical need for timely genetic testing, stating, “Almost all of the samples will go for further testing anyway. But for some of them, it will be absolutely crucial because you won’t know what you’re looking at.”

The researchers’ work, published in the journal Neuro-Oncology, details how they have harnessed nanopore technology to abbreviate diagnostic timeframes substantially. This cutting-edge method employs devices with membranes featuring tiny pores through which an electric current flows. As DNA enters the pore, it is “unzipped” into single strands, and as each strand passes through, it disrupts the current in a unique pattern. This disruption allows the DNA sequence to be read, facilitating real-time classification against known brain tumour markers.

The costs associated with this diagnosis are notably competitive, estimated at around £400 per sample, comparable to traditional genetic testing methods. Initial trials demonstrate a promising level of accuracy; for instance, 80% of the previously extracted samples and 90% of samples taken during surgery were correctly classified within 24 hours. Most strikingly, 76% of the newly collected samples were confidently classified within just one hour. This time efficiency could mean that surgeons could have access to crucial diagnostic information a mere two hours after removing a tumour.

Loose highlighted the importance of this rapid testing capability, which may not only facilitate timely discussions regarding patient treatment in the context of surgical teams but could also directly inform the type of surgery performed on a patient during their operation. Furthermore, the potential exists for this innovation to allow targeted drug delivery during surgery if a specific tumour type is swiftly identified.

This shift towards quicker diagnoses could have broader implications as well. Rapid identification may expedite patient recruitment for clinical trials, enhancing the progression of new therapeutic options. Dr Matt Williams, a consultant oncologist at Imperial College Healthcare NHS Trust, noted the advancement as a positive step, although he cautioned that the effectiveness of faster diagnoses will depend on how they can be integrated into existing treatment protocols. He remarked, “At the moment, intra-operative treatments don’t really exist, although several groups are working on it. But if we want to unlock these approaches, we need to be able to make those diagnoses in the operating theatre to then be able to deploy these treatments.”

The developments in nanopore technology not only have the potential to revolutionise brain tumour diagnostics but are also part of a broader trend in healthcare aimed at improving treatment response times. Similar technology is being employed in various projects, including partnerships with agencies like Genomics England, aimed at speeding up the diagnosis of severe respiratory infections in an effort to prepare for future pandemics. These interdisciplinary applications demonstrate the versatility and promise of nanopore sequencing technology in various medical contexts, spotlighting its emerging role in enhancing patient care and outcomes.

A significant advance in this field has already been observed with other studies demonstrating the effectiveness of rapid diagnostics. One recent study in Nature Medicine achieved tumour classification within 15 minutes, showcasing the possible real-time application of these techniques in surgical settings, while another validation of workflow achieved rapid classification of central nervous system tumours in under 30 minutes. These findings collectively highlight a trend toward more immediate and actionable diagnostics, moving medicine closer to the goal of individualised treatment strategies.

As the implementation of this revolutionary diagnostic method progresses, there remains a clear expectation of not just improved patient experiences but potentially transformative impacts on treatment outcomes for brain tumour patients across the globe.

### Reference Map

1. Paragraphs 1, 2, 3, 4
2. Paragraphs 5, 6
3. Paragraph 7
4. Paragraph 8
5. Paragraph 9
6. Paragraph 10
7. Paragraph 11

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## Bibliography

1. <https://www.theguardian.com/science/2025/may/21/brain-tumour-diagnosis-could-be-made-within-hours-say-researchers> - Please view link - unable to able to access data
2. <https://www.theguardian.com/science/2025/may/21/brain-tumour-diagnosis-could-be-made-within-hours-say-researchers> - A new method for diagnosing brain tumours could cut the time patients wait for treatments by weeks to hours and raise the possibility of novel types of therapy, researchers have said. According to the Brain Tumour Charity, about 740,000 people around the world are diagnosed with a brain tumour each year, around half of which are non-cancerous. Once a brain tumour is found, a sample is taken during surgery and cells are immediately studied under a microscope by pathologists, who can often identify the type of tumour. However, genetic testing helps to make or confirm the diagnosis. “Almost all of the samples will go for further testing anyway. But for some of them it will be absolutely crucial, because you won’t know what you’re looking at,” said Prof Matthew Loose, a co-author of the research from the University of Nottingham. Loose noted that in the UK there could be a lag of eight weeks or longer between surgery and the full results of genetic tests, delaying the confirmation of a diagnosis and hence treatment such as chemotherapy. Writing in the journal Neuro-Oncology, Loose and colleagues report how they harnessed what is known as nanopore technology to cut this timeframe. The approach is based on devices that contain membranes featuring hundreds to thousands of tiny pores, each of which has an electric current passing through it. When DNA approaches a pore it is “unzipped” into single strands; as a strand passes through the pore it disrupts the electric current. Crucially, the different building blocks of DNA – and modifications to them – disrupt the current in characteristic ways, allowing the DNA to be “read”, or sequenced. These sequences are then compared against those relating to different types of brain tumours, using a software program built by the team. Loose said the process costs about £400 per sample – on a par with current genetic testing. The researchers first trialled the approach on 30 samples that had previously been extracted from patients, before using it on 50 samples at the time they were removed. They said 24 (80%) and 45 (90%) of these samples respectively were fully and correctly classified by the new approach after 24 hours, a success rate on a par with traditional genetic testing methods. However, 38 (76%) of the 50 samples that were prospectively collected were confidently classified within one hour, meaning the time from sample removal to surgeons having the results could be as little as two hours. While Loose said the main goal was to make sure the information is available when the patient is next discussed by their medical team, typically in the same week, he said the rapid results could also reveal whether more aggressive surgery is needed while the patient is already in theatre, or if surgery is likely to offer little benefit. And there are other possibilities. “If you could identify, as we think we might be able to, the specific tumour type fast enough, and drugs were available that could be administered during surgery directly to the tumour area, then you have opened up a whole new class of potential treatment options,” he said. In addition, he said, rapid diagnoses could help ensure patients are recruited into relevant clinical trials for new treatments as quickly as possible. Dr Matt Williams, a consultant oncologist at Imperial College healthcare NHS trust, who was not involved in the work, said while faster diagnoses were welcome and reduced the period of uncertainty for patients, the main question was how the new technology could be used to change care. “At the moment [intra-operative treatments] don’t really exist, although several groups are working on it,” he said. “But if [we] want to unlock these approaches, we need to be able to make those diagnoses in the operating theatre to then be able to deploy these treatments.”
3. <https://www.ft.com/content/a3b33b3e-9216-481a-9a31-71dcb63b7e1a> - UK health agencies are collaborating with Oxford Nanopore Technologies to enhance the speed of dangerous pathogen screening and provide early warnings of pandemic threats. This initiative, to be implemented across up to 30 NHS sites, seeks to identify and recommend treatments for severe respiratory infections within six hours of sample collection. This effort arises from the need to improve disease monitoring and preparedness in the wake of the Covid-19 pandemic. The project is expected to bolster national surveillance systems and will capitalize on Oxford Nanopore's long-read sequencing technology which identifies large DNA and RNA fragments without breaking them. The partnership involves Genomics England and UK Biobank and aims to better monitor bacterial and viral threats and provide visibility on drug-resistant pathogens. Oxford Nanopore rose to prominence during the Covid pandemic but has seen a decline in revenue since. The company's new project with the UK government will commence in 2025 and is supported by a £50 million investment from Novo Holdings.
4. <https://nanoporetech.com/zh/blog/science-unlocked-publication-picks-from-march-2025> - In March 2025, Oxford Nanopore Technologies highlighted several significant publications in the field of cancer research. Notably, a study in Nature Medicine demonstrated a live brain tumour classification method combining Oxford Nanopore sequencing with MethyLYZR, an epigenomic analysis tool. This approach achieved 94.5% accuracy within 15 minutes and required minimal computational power, showcasing its potential for future intraoperative diagnostics. Another study validated the Rapid-CNS2 workflow, an Oxford Nanopore-based method that classified central nervous system tumours in under 30 minutes. This method detected key variants previously missed by short-read methods and achieved up to 94.6% concordance with standard diagnostic tests, highlighting its potential to accelerate personalised cancer care.
5. <https://onlinelibrary.wiley.com/doi/10.1111/bpa.13203> - A study published in Brain Pathology demonstrated that nCNV-seq, a modification of the SMURF-seq, has the potential to be a robust and rapid test to detect CDKN2A/B homozygous deletion and 1p/19q codeletion. The study showed high correlation between Illumina WGS and nCNV-seq, with the major difference being that nCNV-seq uses native DNA for sequencing. This approach can obtain information on DNA methylation status for tumor classification by methylome profiling. The study advocates for independent validation of the nCNV-seq approach in larger studies to support its routine use in clinical practice.
6. <https://www.insideprecisionmedicine.com/news-and-features/nanopore-sequencing-comprehensively-profiles-brain-tumor-dna-in-30-minutes/> - Scientists have unveiled a solution to long-standing challenges in molecular data integration for central nervous system (CNS) tumor diagnostics. A Nature Medicine study introduces a nanopore sequencing workflow called Rapid-CNS2 that delivers real-time tumor classification and DNA insights within just 30 minutes during surgery and comprehensive molecular profiling within 24 hours. Complementing it is MNP-Flex, a platform-agnostic methylation classifier that achieved over 99% accuracy across over 78,000 samples worldwide. Together, these tools, developed by researchers at University Hospital Heidelberg, Hopp Children’s Tumor Center (KiTZ), and the German Cancer Research Center (DKFZ), offer advanced speed and accuracy, enabling rapid, actionable insights to guide personalized treatment strategies for CNS tumors.
7. <https://www.eastgenomics.nhs.uk/about-us/news-and-events/real-time-dna-analysis-for-brain-tumours-could-guide-surgeons-as-they-operate/> - Dr. Paine and the team have developed a pathway to diagnose brain tumours that is quick, efficient, and accurate, aiming to be adopted by NHS Trusts across the UK. The nanopore sequencer is relatively inexpensive, potentially improving the equity of access to genetic testing for patients nationwide. The team is working to validate and integrate the nanopore technology into routine clinical practice, both in Nottingham and, in the longer term, across the country.