

## Biomarkers

*A biomarker is a biological marker, or indicator, such as a molecule or gene, that can be found in our DNA. Biomarkers can be used by doctors to give them a better understanding of a disease, for example, the presence of a particular gene may indicate that you are more likely to get a particular illness.*

*Certain biomarkers can also give doctors an indication of how a disease is likely to respond to a treatment, or how it is likely to progress. With cancer, biomarkers may be helpful in predicting the speed at which your tumour is growing or how well you may respond to treatments such as chemotherapy.*

### In this fact sheet:

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- The BRAF test
- Answers to some common questions that you may have about biomarkers

## Biomarkers and brain tumours

If you have a brain tumour, a biomarker test may be used to look at genes associated with your type of tumour.

It is very important to know that biomarkers are not treatments and that research is still in early stages, but they may be useful in diagnosing your tumour and could help to plan appropriate treatment. Biomarker tests can also be useful in finding out whether a particular clinical trial is likely to be helpful to you.

At the moment, there are two main biomarker tests for brain tumours. These are the MGMT methylation test and the 1p/19q test - however not all hospitals offer these tests. There are also the IDH-1 and the BRAF tests for a few selected types of tumour.

The Brain Tumour Charity's research funding has contributed to the development of the 1p/19q, IDH-1 and BRAF tests.

## The MGMT methylation test

### What is the MGMT methylation test?

The MGMT methylation test can be useful in predicting how effective chemotherapy treatment is likely to be for you and can be used to help plan a suitable, individualised treatment plan.

### How does the test work?

MGMT is a gene that is responsible for the coding of a protein involved in DNA repair. The MGMT test is used to determine the levels of activity of the MGMT protein.

Because it is involved in DNA repair, the MGMT protein can disturb the action of some chemotherapy drugs (such as Temozolomide). It does this by taking away the point at which the chemotherapy attacks most effectively. Higher levels of the MGMT protein can therefore lower the effectiveness of some chemotherapy drugs.

### Can I have the MGMT methylation test?

For information about whether the MGMT methylation test may be suitable for you, please see *page 2* of this fact sheet.

## The 1p/19q test

### What is the 1p/19q test?

The 1p/19q test may predict long-term survival in people who have some types of brain tumour. The test can also be useful in diagnosing some types of brain tumours, and in making decisions about the most appropriate treatment type for you.

### How does the test work?

Our bodies are made up of cells. Each cell has 23 pairs of chromosomes, which carry genes that you inherit from your mother and father.

The 1p/19q test looks at genetic changes to chromosome numbers 1 and 19 in tumour cells and whether these genes are complete or have a section missing (which is known as 'loss of heterozygosity'). Loss of sections 1p/19q in tumour cells are associated with improved outcomes in people with some types of brain tumour.

### Can I have the 1p/19q test?

For information about whether the 1p/19q test may be suitable for you, please see *page 2* of this fact sheet.

## The IDH-1 test

### What is the IDH-1 test?

The IDH-1 test may predict long-term survival in people who have some types of brain tumour. It may also be useful in predicting how effective a particular treatment is likely to be.

### How does the test work?

IDH-1 is a gene. A mutation (change) in the IDH-1 gene has been found in a large number of astrocytomas, oligodendrogliomas and secondary glioblastomas.

For people with high grade glioma, mutations to the IDH-1 gene are often linked with longer-term survival rates. It is not yet clear, however, how mutations to the IDH-1 gene link to outcomes for people with low-grade brain tumours. In addition to long-term survival rates, scientists have looked at whether the IDH-1 gene mutation predicts treatment outcomes.

Further research needs to be carried out before clear conclusions can be drawn, but it looks possible that chemoradiotherapy (a combination of chemotherapy and radiotherapy) may be more effective for people who have the IDH-1 mutation than those who do not.

#### **Can I have the IDH-1 test?**

If you have a glioma, you may be suitable for IDH-1 testing but please speak to your neuro-oncologist for information and advice.

## *The BRAF test*

#### **What is the BRAF test?**

The BRAF test (along with other investigations) can sometimes help to determine whether a tumour is a pilocytic astrocytoma (a type of grade 1 tumour) rather than another type of (non-pilocytic) astrocytoma if there is uncertainty.

#### **How does the test work?**

BRAF is a gene that makes a protein called B-raf. The B-raf protein is important because it sends signals to help direct the growth of cells within our body. Signals sent from the BRAF gene to the cells is known as the 'BRAF pathway'.

Research has found that some brain tumours (some types of grade 1 and 2 astrocytoma, including grade 1 pilocytic astrocytoma) sometimes have a fault with their BRAF gene.

The fault leads to the BRAF gene permanently sending signals that make cells divide and create copies of themselves. This uncontrolled growth of cells forms a tumour.

#### **Can I have BRAF testing?**

BRAF testing is only clinically useful in a few selected tumour types and is most commonly used to determine whether a tumour is a pilocytic astrocytoma. If you are interested in BRAF testing, please speak to your neuro-oncologist for information and advice.

## *Is biomarker testing suitable for me?*

Biomarker testing is not suitable for everyone with a brain tumour and The Brain Tumour Charity is unable to advise on your individual case. Please speak with your neuro-oncologist if you would like to know more about a particular biomarker test and whether it is suitable for you. The MGMT test, the 1p/19q test, the BRAF test and the IDH-1 test can only be carried out once you have had a biopsy and the biopsy material has been analysed. It does not matter how long ago the biopsy was performed, so old samples can be used.

The types of brain tumour that may be suitable for MGMT biomarker testing are:

- Anaplastic astrocytoma
- Anaplastic oligodendroglia
- Anaplastic oligoastrocytoma
- Glioblastoma
- Anaplastic gliomas

The types of brain tumour that may be suitable for 1p/19q testing are:

- Oligodendroglia
- Anaplastic oligodendrogloma
- Oligoastrocytoma
- Anaplastic oligoastrocytoma

In some cases, the test may be carried out with glioblastoma.

## *How can I get biomarker testing?*

If you are interested in having a biomarker test, the first thing you will need to do is speak to your neuro-oncologist, who will be able to tell you whether they think it is suitable for you. If they feel it would be beneficial, they may arrange for the testing to happen at the hospital you are being treated at. If the hospital does not carry out such tests, they may refer you elsewhere.

It is important to note that not all hospitals carry out biomarker testing and the tests will not necessarily influence your treatment plan at the hospital you attend.

If your neuro-oncologist does not believe that biomarker testing would be beneficial to you, you could ask them to talk through with you how they have made their decision. If, after this, you would still like to pursue biomarker testing, you may wish to ask your medical insurers if they would pay for them, or you may wish to have the testing done privately and pay for it yourself. Either way, you will need to provide information such as biopsy samples. To obtain these, you will need to speak to your neuro-oncologist.

The number of centres offering biomarker testing is growing as research in the area develops. If you would like information on which centres carry out the tests, contact The Brain Tumour Charity's Information and Support team.

## *What are the advantages of biomarker testing?*

Research in the area of biomarker testing and brain tumours is still in its early stages. The test results may, however, give more detailed information about your tumour and so help to plan appropriate treatment. The results may also help give an indication as to which clinical trials may be suitable for you.

## *What are the potential disadvantages of biomarker testing?*

While many scientists believe that biomarker testing is helpful, others argue that its limitations may lead to conclusions that are not valid. Such limitations include measurement errors and other factors that could confuse the results (such as your weight or diet, or the laboratory equipment used to carry out the tests).

Some people feel that, from an emotional perspective, they would prefer not to know so much detail about their tumour and the likely outcomes according to the tests. For example, if you chose to have a biomarker test which indicated that your tumour has traits that do not respond well to treatment, this is likely to be difficult news. Whether to have biomarker testing is therefore a decision that needs careful consideration and that needs discussing with your medical team and family.

## What if I have further questions?

If you require further information, any clarification of information, or wish to discuss any concerns, please contact our Information and Support Team:

Call: 0808 800 0004

(free from landlines and most mobiles:  
3, O2, Orange, T-mobile, EE, Virgin and Vodafone)

Email: [info@thebraintumourcharity.org](mailto:info@thebraintumourcharity.org)

Join our online forums at:  
[thebraintumourcharity.org](http://thebraintumourcharity.org)

## About us

The Brain Tumour Charity makes every effort to ensure that we provide accurate, up-to-date and unbiased facts about brain tumours. We hope that these will add to the medical advice you have already been given. Please do continue to talk to your doctor if you are worried about any medical issues.

We are the UK's leading brain tumour charity. We fund scientific and clinical research into brain tumours and offer information and support to those affected, whilst raising awareness and influencing policy.

We rely 100% on charitable donations to fund our vital work. If you would like to make a donation, or want to find out about other ways to support us including fundraising, leaving a gift in your will or giving in memory, please visit us at [thebraintumourcharity.org](http://thebraintumourcharity.org) or call us on **01252 749990**

## About this fact sheet

This fact sheet has been written and edited by The Brain Tumour Charity's Information and Support Team. The accuracy of medical information has been verified by a leading neuro-oncologist. Our fact sheets have been produced with the assistance of patient and carer representatives and up-to-date, reliable sources of evidence. If you would like a list of references for any of the fact sheets, or would like more information about how we produce them, please contact us.



## Biomarkers

Your notes



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information, awareness & policy**

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