

Temozolomide (Temodal®)

Temozolomide (TMZ) is a type of chemotherapy drug used worldwide for the treatment of high grade gliomas and, more specifically, anaplastic astrocytoma (Grade 3) and glioblastoma (Grade 4). (For more information on tumour types and grading, see our 'What is a brain tumour?' fact sheet)

This fact sheet contains information you may find helpful if you or someone you care for is receiving TMZ.

In this fact sheet:

- What is Temozolomide?
- How is Temozolomide taken?
- How does Temozolomide work?
- What are the side-effects of Temozolomide?
- Further information

What is a Temozolomide?

TMZ has been an approved drug treatment for patients with high grade gliomas (tumours arising from glial cells) in the UK since 2007. Even though TMZ may cause some side-effects, just as other chemotherapy drugs do, the results of large-scale clinical trials have shown that the possible benefits far outweigh the risks for the treatment of high-grade gliomas. (See our Chemotherapy fact sheet for more information)

In terms of effectiveness, large-scale clinical trials have shown that TMZ alongside radiotherapy improves average survival for glioblastoma patients compared to those who only receive radiotherapy. Today, TMZ is referred to

as the 'international gold standard' of treatment as it is the main chemotherapy drug used globally for the treatment of glioblastoma.

How is Temozolomide taken?

Your oncologist will decide what dosage of TMZ you should take and for how long according to your treatment plan, general health and the results of regular tests during therapy (such as your full blood count and bone marrow function). This section provides you with information on the standard administration of the drug.

TMZ is usually taken orally in the form of a pill, on an empty stomach (1 hour before or 2 hours after a meal), with a glass of water. If you've been newly-diagnosed with a glioblastoma, a typical treatment would be radiotherapy for 6 to 7 weeks alongside TMZ to be taken orally every day (preferably at the same time each day). This initial period is known as the 'concomitant phase'. During this phase, on a weekly basis, your oncologist will decide whether TMZ administration should continue, be postponed or discontinued based on the results of regular blood tests.

Four weeks after the end of radiotherapy, you may enter what is known as the 'monotherapy phase' of treatment. This involves taking TMZ for the first 5 days of a 28 day cycle. You might receive TMZ for up to 6 such cycles (i.e. over a 6 month period). Blood counts will be taken once on the last day of each cycle.

A monotherapy treatment of TMZ might also be prescribed for adults or children with malignant gliomas as a second line of treatment; when the tumour has not responded to other standard treatment, or when there is tumour recurrence.

How does Temozolomide work?

TMZ is a type of chemotherapy drug known as an alkylating agent. This means it binds to the DNA in cells and interferes specifically with cell growth and division.

When taken, TMZ gets absorbed rapidly and unlike many substances it is able to pass across the blood-brain barrier (BBB). The BBB is a membrane of cells that helps block potentially harmful substances in the blood from entering the brain. TMZ has been a breakthrough drug in the treatment of brain tumours because it is able to reach the brain by passing through this protective membrane when almost all other drugs are unable to.

TMZ cannot discriminate between healthy cells and tumour cells, but it's main

effect is on rapidly dividing cells, such as tumour cells, as these don't have time to repair themselves. As a result, healthy cells are able to repair DNA damage and recover while tumour cells can't.

However, in some cases cancer cells can also become resistant to the effect of TMZ. Research funded by The Brain Tumour Charity found that tumour cells containing high amounts of a form of MGMT (a gene responsible for DNA repair) are able to repair themselves, making TMZ less effective. At present, only a biopsy sample of the tumour can reveal the levels and form of MGMT present in tumour cells. Knowing the level of MGMT in tumour cells could enable your oncologist to tailor your treatment accordingly. (See our Biomarkers fact sheet for more information)

What are the side-effects of Temozolomide?

Like all chemotherapy drugs TMZ may cause one or more side-effects. This section lists some of the most common side-effects of TMZ.

- **Pneumonia** – If you are being treated with TMZ, you run an increased risk of developing a type of pneumonia known as *Pneumocystis Jirovecii* Pneumonia or PCP. This is a fungal infection of the lungs, caused by a fungus that is common in the environment and can cause infection in people with weakened immune systems. For this reason your oncologist may prescribe a preventative antibiotic to reduce the chance of getting this infection.
- **Low blood count**— TMZ treatment can cause a 'low platelet count'. Platelets help the blood clot and so a low platelet counts can increase the risk of bleeding significantly. If the results of blood tests show a low platelet count your doctor might consider delaying your treatment or reducing the dose you receive. In rare cases TMZ can cause a more serious blood condition known as 'pancytopenia'. Pancytopenia is when red and white blood cells, as well as platelets are lower than normal. In such cases, you might receive blood and platelet transfusions (injections of blood) and G-CSF support (injections which help boost immunity).
- **Infection** – A lower white blood cell count caused by TMZ treatment may weaken your resistance to infection. If you are being treated with TMZ, you might be advised to avoid individuals with infection as much as possible. You should be given written information about what to do and who to contact if you get a temperature, sore throat or other signs of an infection. You should inform your oncologist immediately if you experience any symptoms such as sore throat or high temperature.

- Fatigue – People have reported feeling tired during, and for a period of 6-12 months following their treatment.
- Nausea and vomiting – Nausea is one of the most common side-effects of TMZ and doctors usually prescribe anti-emetic (anti-sickness) medication to manage it.
- Loss of appetite – If you are experiencing a lack of appetite as a result of TMZ treatment you may ask to speak to a dietitian who can monitor your weight and give you advice on how to supplement your diet.
- Constipation – Constipation is another common side-effect of TMZ treatment. If you suffer from TMZ-induced constipation, you can ask your doctor for some medication that might help manage this symptom.
- Amenorrhoea – If you are female you might temporarily stop having periods.
- Loss of fertility – TMZ can in some cases cause infertility in both men and women. Before starting treatment with TMZ, your doctor should discuss available options for preserving your fertility with you.

Further information

This factsheet covers the main drug characteristics and most common side-effects. However, the material covered here is not exhaustive. If you require the full, detailed drug information on Temozolomide, you can find it here:

<http://www.medicines.org.uk/emc/medicine/7027>

Questions you might want to ask your doctor

- What should I do if I miss a dose or take too much by mistake?
- How do I manage any side-effects TMZ may cause?
- If I begin to feel ill do I visit my GP, make an appointment at clinic or call 999?
- What are the most common side effects, what should I expect?
- What do I do if I struggle with swallowing the tablets; can I take it in another form?
- What should I do if friends have infections?
- Are there any inoculations or vaccines I should avoid taking?

- Are there any inoculations or vaccines you recommend I should get?
- Will my GP be informed of my treatment protocol, how will they be involved in my treatment?

What if I have further questions?

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

Call 0808 800 0004 (free from landlines and most mobiles including 3, O2, Orange, T-mobile, EE, Virgin and Vodafone)

- Email: support@thebraintumourcharity.org
- Join our closed Facebook group:
bit.ly/supportonfacebook

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.

The Brain Tumour Charity is at the forefront of the fight to defeat brain tumours and is the only national charity making a difference every day to the lives of people with a brain tumour and their families. We fund pioneering research to increase survival, raise awareness of the symptoms and effects of brain tumours and provide support for everyone affected to improve quality of life.

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 www.thebraintumourcharity.org, call 01252 749043 or email fundraising@thebraintumourcharity.org

About this fact sheet

This fact sheet has been written and edited by The Brain Tumour Charity's Support and Information Team. The accuracy of medical information has been verified by a leading health professionals specialising in neuro-oncology. Our fact sheets have been produced with the assistance of patient

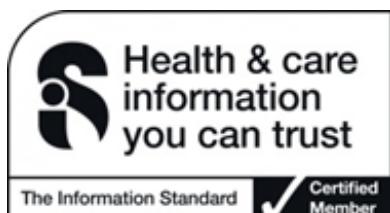
and carer representatives and up-to-date, reliable sources of evidence. If you would like a list of references for any of the fact sheets, or would like more information about how we produce them, please contact us.

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Your notes



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