

# Chemotherapy

When you are diagnosed with a brain tumour, there are several ways your health team may treat you. One of these is by chemotherapy. This is the use of cytotoxic (anti-cancer) drugs to destroy tumour cells by disturbing their growth. Chemotherapy is sometimes used on its own, together with radiotherapy, or it may be used before surgery to shrink the tumour or afterwards to prevent it from returning.

## In this fact sheet:

- How chemotherapy works
- How chemotherapy is given
- After treatment
- Answers to some common questions you may have about chemotherapy

This fact sheet is relevant to chemotherapy in adults - please note there will be significant differences for children receiving chemotherapy. (For further information, see *Chemotherapy for children* fact sheet).

## What is chemotherapy?

Our bodies are made up of cells, which divide as part of their natural cycle. Tumours occur when cells divide at a faster rate than normal. Chemotherapy is the use of drugs that affect the growth of tumour cells by interfering with the way they divide and create copies of themselves.

Chemotherapy acts on all dividing cells, including healthy cells, but healthy cells are able to repair themselves better than tumour cells, so fewer of them die after treatment.

## Why is chemotherapy given?

Your health team will carefully consider the best course of treatment for you. This will depend on:

- The type of tumour you have and whether it has spread
- Your general health and fitness
- Your age.

You should feel free to ask your health team as many questions as you wish.

Chemotherapy may be given:

- Before surgery to shrink a tumour to make it easier to operate on
- During or after surgery to kill small amounts of cells that haven't been removed, to reduce the chance of the tumour returning
- To treat a tumour that has returned
- To shrink a tumour that cannot be operated on
- To prevent further growth of a tumour
- Prior to radiotherapy.

## How is treatment given?

Chemotherapy will be given to you in a series of treatments separated by rest periods. A treatment session and rest period is called a 'cycle' and cycles make up the 'course' of treatment.

There are a number of ways chemotherapy can be given:

### Tablets

Some chemotherapy drugs can be taken in tablet or capsule form like any other tablet. They are absorbed and carried around your body in the bloodstream to reach the tumour cells.

You will be able to take the tablets at home, but will need to take care to touch them as little as possible and should wash your hands straight afterwards. If possible, wear disposable medical gloves when handling the tablets.

You should not crush them to take them, unless you are advised to. There can also be an after-taste to these drugs - chewing flavoured gum afterwards can help to disguise this taste.

As with all medication, tablets should be kept out of the reach of children.

### Injection or drip

Chemotherapy drugs can be injected into a vein ('intravenously') or into the spinal fluid ('intrathecally'). They can also be given via a drip to the veins over a time period of half an hour to a few hours. As with tablets, the drugs are absorbed and carried around your body in the bloodstream to reach the tumour cells.

### Wafers

Chemotherapy drugs are sometimes put inside a polymer wafer and inserted into the brain during surgery. The polymer wafers are made from a biodegradable material (i.e. one that breaks down in the body). They look a bit like a large white chocolate button and are placed in the brain where the tumour started. The polymer gradually dissolves over 2-3 weeks, releasing the chemotherapy drug (usually carmustine) directly into the brain. Wafers are used to target cells which couldn't be removed by surgery. You may also hear these implants referred to as Gliadel® wafers.

At the moment, the use of these wafers is subject to NICE recommendations. (NICE is the National Institute for Health and Care Excellence). As such, they are only licensed for people with high grade gliomas, or with glioblastomas (GBM) that have returned after treatment. (See *What is a brain tumour?* fact sheet). Also the surgeon must be confident that at least 90% of the tumour has been removed before they can be used.

### Ommaya reservoir / Ventricular access device (VAD)

This is a dome-shaped device that sits underneath the scalp and delivers chemotherapy directly into the cerebrospinal

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fluid (CSF), the clear fluid within the brain and spinal cord. By doing this, chemotherapy is delivered directly to the brain, which increases its effectiveness.

## Why are treatment periods followed by rest periods?

Rest periods between treatment sessions allow your body to recover from any side-effects and give healthy cells a chance to repair themselves.

Having chemotherapy in a series of cycles also enhances its effectiveness. This is because chemotherapy only destroys cells that are in the process of dividing. Tumour cells are not dividing all the time so there will be times when they are resting. The first time you are given chemotherapy it won't work on the cells that are resting. During the second treatment session, the cells that were resting the first time may now be dividing and the chemotherapy will destroy them.

## How long will chemotherapy last?

Individual treatment plans vary and yours will be carefully planned for you specifically. Typically though, a course of treatment may last 3-6 months, consisting of 4-8 cycles. You may have chemotherapy on a few days every few weeks.

## Is there a maximum number of times I can have chemotherapy?

This depends on the type of chemotherapy drug. Some are limited based on 'cumulative toxicity' i.e. with each dose, there are increased side-effects that affect body functions, and a limit is set to prevent these side-effects becoming too severe. Others are stopped either because they are not working, or an unacceptable toxicity (level of harmfulness) occurs, or you can no longer tolerate the drug.

## Do I need to stay in hospital during the chemotherapy?

Chemotherapy is generally given as an outpatient treatment, which means that you don't have to stay in hospital overnight, although in certain circumstances you will need to. A member of your health team will talk to you about this before you start your treatment.

If you are taking tablets, you can take these at home. If you are having chemotherapy by injection, you would usually have this in a chemotherapy clinic. You may be in the clinic for up to a few hours as you'll need to have blood tests before the treatment and wait for the results to check it's safe for you to have the injection. If you have chemotherapy by drip, this will generally happen in the hospital.

## What side-effects can I expect?

The fact that chemotherapy acts on dividing cells explains some of its side-effects. Cells in the body that divide frequently (i.e. skin and hair cells and cells lining the digestive system) are therefore vulnerable to chemotherapy. This is why these parts of the body are often affected by chemotherapy.

Side-effects vary from person to person and according to the drugs you have been given. As chemotherapy (temporarily) acts on healthy cells as well as tumour cells though, it may cause some unpleasant short-term side-effects, which commonly include:

### Lowered immunity

Chemotherapy temporarily lowers the white blood cell count. 'Neutropenia' is the medical term used to describe an abnormally low number of neutrophils, the most common type of white blood cell. White blood cells play a vital role in fighting infection, so you may be more susceptible to other infections during this time. Your health team will monitor you and will give you antibiotics to help fight infection if necessary. If you have a temperature over 38 degrees or are feeling unwell, always seek advice from your health team.

### Increased risk of bleeding/bruising

Some chemotherapy drugs can cause a reduction in the number of platelets in the blood. This is known as thrombocytopenia and is a common occurrence with temozolomide and PCV. (See section *Names of chemotherapy drugs further on in this fact sheet*). Platelets are tiny cells that help the blood to clot, which is important in repairing damaged blood vessels - for example, if you cut yourself. A low platelet count (level) can therefore increase the risk of bleeding. Signs of a low platelet count include nosebleeds, bleeding gums, heavy periods, bruising and tiny blood spots in the skin known as petechiae. You should tell your health team straight away if you have any of these symptoms.

Platelets can also be lowered with blood thinning treatments, such as dalteparin, a type of heparin. These may be given after surgery when people are prone to potentially harmful blood clotting, due to their lack of activity. If you are given these, you will need to be monitored carefully.

### Tiredness

Many people who have chemotherapy experience tiredness and low energy (fatigue). This can be frustrating if you have been an active person up until now. It's important to be patient with yourself and rest as much as you need to. Balance this with some gentle exercise, such as short walks. Ask friends and family for help around the house to conserve your energy. The tiredness will wear off once your course of treatment has finished, but it may take a few months for your energy levels to return to normal.

### Anaemia

Anaemia is a relatively common side-effect of chemotherapy. This is because chemotherapy can temporarily lower the number of your red blood cells. These carry oxygen around the body in a substance called haemoglobin (Hb). Symptoms of anaemia include extreme tiredness, shortness of breath and irregular heartbeat.

If you have any of these symptoms, tell your health team as soon as possible. You may need to have a blood transfusion to increase the number of red blood cells, or take a medicine that can help boost your body into producing more red blood cells.

Iron is needed to produce the haemoglobin, that carries the oxygen around the body, so eating a diet high in iron can help to maintain the level of haemoglobin in your blood. Foods high in iron include dark green leafy vegetables (such as broccoli and watercress), beans, nuts, meat and dried fruits (such as apricots and raisins).

#### Nausea

Some people experience nausea (feeling sick) or actually do vomit after treatment. Not all chemotherapy drugs cause this however, and some people experience no sickness at all. Your health team will be able to give you some anti-sickness tablets if you are affected by nausea or if the particular chemotherapy drugs you are having are known to be likely to cause it.

#### Hair loss

Not all chemotherapy causes hair loss, it really depends on which drug or combination of drugs you have. Some drugs result in no hair loss at all, or only a very small amount. Most chemotherapy drugs used for brain tumours do not cause complete alopecia (hair loss), but may thin hair.

Generally, any hair loss (thinning) will start within a few weeks of treatment beginning. Once treatment has finished, hair should begin to grow back over the next few months, but it may be different to how it was previously e.g. a different texture or colour. If you are concerned, ask your health team about what options are available to minimise hair loss.

*For information about where to find wigs or headwear, please see the Resources section further on in this fact sheet.*

#### Sore mouth (oral mucositis)

Oral mucositis (inflammation of the inside of the mouth) is a possible side-effect of chemotherapy that is more likely with high doses. Some people describe oral mucositis as feeling similar to when you burn your mouth from eating or drinking something that is too hot. If you experience oral mucositis, you may also suffer from ulcers in your mouth or on your tongue and lips.

Symptoms of mucositis usually begin 7-10 days after you start chemotherapy, but will usually clear up on their own within a few weeks after treatment has ended. However, it can be very unpleasant. It is possible for ulcers to bleed and to become infected, particularly as your immunity may also be lowered

from the chemotherapy. This can make it difficult to eat, drink and talk. Sucking on ice cubes or ice lollies can help to relieve discomfort, and there are a number of medicines which can relieve the symptoms. If you are concerned about oral mucositis, it is important to seek medical advice from your health team.

#### Taste, appetite and digestion

Sometimes, chemotherapy causes changes to taste and appetite. It can also cause diarrhoea or constipation. It is important to try and eat healthily and drink plenty of fluids, even if you don't feel like it, particularly if you have diarrhoea. Try small, more frequent meals and sipping drinks through a straw. Speak to your health team, who can recommend suitable medicines to help relieve the symptoms.

#### Effects on skin and nails

It is possible that your skin may become dry and sore, particularly on your hands and feet. Your nails may also become dry and brittle.

Some chemotherapy drugs can cause your skin to become more sensitive to sunlight (and to chlorine), both during chemotherapy and for some time afterwards. It is important, therefore, to ensure that your skin is protected from the sun - use a sunscreen that blocks both UVA and UVB rays (at least SPF protection factor 15); keep covered up; and avoid going out in the sun in the hottest part of the day.

#### Numbness or tingling hands or feet

This is caused by the chemotherapy drug affecting the nerves and is called 'peripheral neuropathy'. You may also find fiddly tasks, such as fastening buttons, difficult. Occasionally this effect can be permanent. Let your health team know if you get these symptoms - they may need to lower the dose.

#### Reaction with alcohol

Some chemotherapy drugs, such as procarbazine and lomustine, can react with alcohol (and non-alcoholic beers and wine), causing sickness, dizziness or breathlessness. When you are taking these drugs, and for about 2 weeks afterwards, it is best to avoid these types of drink.

#### Less common side-effects

Less common side-effects can occur that affect other organs, such as the lungs, liver or kidneys. Some of these cause symptoms, but others can only be detected by blood tests, which will be monitored during your treatment. Your oncologist will go through these possibilities with you.

Side-effects tend to gradually disappear over time once the treatment is complete, but if you are concerned about any of your side-effects, please remember to speak to your health team.

## How will I know if chemotherapy has worked?

At the end of treatment, or sometimes throughout the process, you will be monitored for any changes to the tumour. This can be through the use of scans (Magnetic Resonance Imaging, or 'MRI' and Computerised Tomography, or 'CT') to see whether the tumour is shrinking. (*For more information, see the Scans fact sheet*).

Another way of detecting whether the tumour is responding to treatment is via 'tumour markers' (biomarkers) in the blood. A tumour marker is a product that is secreted by tumour cells. Decreasing volumes of tumour markers suggest that the tumour is shrinking. However, only a few types of brain tumour produce measurable markers.

## What happens after treatment has finished?

You will have check-up appointments following treatment, which will sometimes include scans. These appointments may continue for a number of years after your chemotherapy has finished.

## Names of common chemotherapy drugs

There are around 50 different types of chemotherapy drug. Names of common chemotherapy drugs used to treat primary brain tumours include lomustine (CCNU), procarbazine, carmustine (Gliadel ®), vincristine and temozolomide (Temodal®). You may be given just one, or you may have a mixture - this is called 'combination therapy'. The most common combination of drugs used to treat brain tumour is known as PCV and is a combination of procarbazine, lomustine (CCNU) and vincristine.

## What are chemotherapy drugs made from?

There are many different types of chemotherapy drugs, which are made from different sources and work in slightly different ways to destroy tumour cells. Drugs are made in a laboratory, but many of them are derived from natural plant extracts.

## Resources

There are lots of different styles of wig to choose from, including synthetic (monofibre) and human hair wigs. You can also buy headscarves and other headwear. Whilst we cannot recommend specific companies, below are some companies that sell wigs and headwear:

- [Cancerwigboutique.com](#)

This is an online directory that lists numerous companies selling wigs and headwear.

- [Chemotherapy Headwear](#)

Sells a range of hats and headscarves for people experiencing hair loss following chemotherapy.

[www.chemotherapyheadwear.com](http://www.chemotherapyheadwear.com) / 01483 901403

- [Direct Wigs](#)

Sells a range of both ladies' and gents' wigs, hair pieces and headscarves.

[www.directwigs.co.uk](http://www.directwigs.co.uk) / 01793 632152

- [4myhead.com](#)

An online shop for hats, scarves and wigs for cancer patients.

[www.4myhead.com](http://www.4myhead.com) / 07505 028 099

(These resources are relevant to adults - for resources for children receiving chemotherapy, please see *Chemotherapy for children fact sheet*).

**You can get free synthetic wigs on the NHS if:**

- you're under 16, or under 19 and in full-time education
- you're a hospital inpatient
- you're a war pensioner and the wig is for your accepted disablement and you have a valid war pension exemption certificate.

**You're also entitled to help if you:**

- get Income Support
- get Income-based Jobseeker's Allowance
- get Income-related Employment and Support Allowance
- get Universal Credit
- get the Guarantee Credit element of Pension Credit
- are named on or entitled to an NHS tax exemption certificate
- are named on a valid HC2 certificate.

Ask your clinical nurse specialist or staff at the hospital you are being treated at, for more information.

Disclaimer: The Brain Tumour Charity provides the details of other organisations for information only. Inclusion in this fact sheet does not constitute a recommendation or endorsement.

## 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:  
3, O2, Orange, T-mobile, EE, Virgin and Vodafone)

**Email: support@thebraintumourcharity.org**

**Join our online forums at:**

[thebraintumourcharity.org/forums](http://thebraintumourcharity.org/forums)



**Your notes**

## 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 pre-eminent 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), call us on **01252 749043** or email [fundraising@thebraintumourcharity.org](mailto: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 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.

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