

Growth factors

This information is about growth factors that encourage blood cells to develop. You might have growth factors as part of your treatment for lymphoma if you have low blood counts.

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We have separate information about the topics in **bold font**. Please get in touch if you'd like to request copies or if you would like further information about any aspect of lymphoma. Phone 0808 808 5555 or email information@lymphoma-action.org.uk.

What are growth factors?

Growth factors are chemical messengers (hormones) that encourage cells to divide and develop. There are lots of different growth factors that affect different types of cells. This information is about growth factors that encourage blood cells to develop.

Your body makes growth factors naturally. Growth factors can also be made in the lab. These can be used as medicines to boost the production of new blood cells.

Why might someone with lymphoma need treatment with growth factors?

Different growth factors encourage your body to make different cells. People who have lymphoma might need growth factors to help treat low red blood cells (**anaemia**), low white blood cells (**neutropenia**) or low platelets (**thrombocytopenia**). Different growth factors are used in each case.

- A growth factor called granulocyte colony-stimulating factor (G-CSF) tells your **bone marrow** to make more white blood cells. It also encourages **stem cells** (undeveloped cells that can divide and mature into all the types of blood cell your body needs) to move from your bone marrow into your bloodstream.
- A growth factor called erythropoietin (EPO) tells your bone marrow to make more red blood cells.
- A growth factor called thrombopoietin (TPO) tells your bone marrow to make more platelets.

Growth factors for a low white blood cell count

A growth factor called granulocyte colony-stimulating factor (G-CSF) is sometimes used to treat people who have a low white blood cell count (**neutropenia**). This is a common side effect of many **lymphoma treatments**.

What is G-CSF?

G-CSF is a chemical messenger (hormone) that occurs naturally in your body. It is made by immune cells and the cells that line your blood vessels and lymphatic vessels. It tells your **bone marrow** to make more white blood cells. It also encourages stem cells (undeveloped cells that can mature into white blood cells, red blood cells or platelets) to move out of your bone marrow and into your bloodstream.

Several man-made versions of G-CSF are available as a medicine. These include short-acting and long-acting forms:

- short-acting G-CSF: lenograstim and filgrastim
- long-acting G-CSF: pegfilgrastim and lipefilgrastim.

If you need G-CSF, your medical team should tell you which is the most suitable option.

G-CSF helps your neutrophil count recover faster after **chemotherapy**. It can be used to reduce your risk of getting serious **infections**. It is also used to help make sure your chemotherapy doesn't have to be delayed or the dose reduced because of a **low neutrophil count**.

Who might have G-CSF?

You might need G-CSF treatment if:

- you are having chemotherapy, you have a low neutrophil count and your doctor thinks you are at high risk of developing a serious infection
- you are having chemotherapy, you have a low neutrophil count and you have already had a cycle of chemotherapy delayed or the dose reduced because your neutrophil count was too low
- you have **neutropenic sepsis** (a serious, whole-body reaction triggered by an infection in people with a low neutrophil count) and you haven't responded to antibiotic treatment
- you are due to have stem cells collected for a **stem cell transplant**
- you have had a stem cell transplant and your white blood cell count isn't recovering as quickly as it should.

How is G-CSF given?

You have G-CSF as an injection just underneath your skin (a subcutaneous injection) or through a drip into a vein (an intravenous infusion).

- You have short-acting G-CSF once a day. You usually have your first dose 1 to 3 days after your chemotherapy. You then have a dose every day until your neutrophil count recovers. This usually takes 5 to 7 days, although it can be longer. If you are having G-CSF before a stem cell transplant, you usually have your first dose 4 to 6 days before your stem cells are going to be collected.
- You usually have long-acting G-CSF as a single dose the day after your chemotherapy.

You usually have your first dose of G-CSF in hospital to make sure you don't have a reaction to it. After that, if you are having it as an injection under your skin, you – or a friend or family member – might be taught **how to inject yourself at home**. Alternatively, a community nurse might visit you every day to give you your injections.

Side effects of G-CSF

The most common side effects of G-CSF are:

- aching muscles or bones
- headaches
- fever
- tummy pain, diarrhoea or constipation
- feeling or being sick
- bruising or bleeding more easily than usual.

Some people get an itchy rash where they had the injection. These side effects are not normally serious and usually get better when you stop treatment.

G-CSF can cause lung problems (for example, inflammation or fluid on the lungs), particularly if you've recently had a chest infection. Occasionally, this can be serious.

If you develop a cough or high temperature or you have difficulty breathing, contact your medical team.

A small number of people have an allergic reaction to G-CSF. **Contact your doctor urgently if you have any of these symptoms after an injection:**

- **an itchy rash**
- **swelling of your face, lips, tongue or throat**
- **difficulty breathing**
- **feeling faint.**

Growth factors for a low red blood cell count

A growth factor called erythropoietin (EPO) is sometimes used to treat people who have a low red blood cell count (**anaemia**).

What is EPO?

EPO is a chemical messenger (hormone) that occurs naturally in your body. It is made by your kidneys and tells your bone marrow to make more red blood cells. Several man-made versions of EPO are available as a medicine. These include:

- epoetin alfa
- epoetin beta
- epoetin zeta
- darbepoetin alfa.

Who might have EPO?

You might have EPO treatment if you are having chemotherapy and your haemoglobin level is lower than 80 g/L (grams per litre). It increases your haemoglobin level and can reduce the number of blood transfusions you need. Some people have iron treatment as well.

How is EPO given?

You have EPO as an injection just underneath your skin, usually in your tummy, thigh or upper arm. If you need EPO, you usually have it for the whole time you're on chemotherapy and sometimes for around 4 weeks afterwards. You might need it once a week or several times a week. You – or a friend or family member – might be taught **how to inject yourself at home**. Alternatively, a community nurse might visit you every day to give you your injections.

Side effects of EPO

Side effects of EPO include:

- headache
- fever
- rash
- joint pains
- flu-like symptoms
- sickness
- diarrhoea.

Rarely, EPO can cause serious side effects such as blood clots or high blood pressure.

If you develop a cough, chest pain, weakness or numbness, slurred speech or your arm or leg become red, swollen or painful, contact your medical team.

A small number of people have an allergic reaction to EPO. **Contact your doctor urgently if you have any of these symptoms after an injection:**

- **an itchy rash**
- **swelling of your face, lips, tongue or throat**
- **difficulty breathing**
- **feeling faint.**

Growth factors for a low platelet count

A growth factor called thrombopoietin (TPO) is occasionally used to treat people who have a low platelet count ([thrombocytopenia](#)).

What are TPO receptor agonists?

TPO is a chemical messenger made in your liver. It tells your bone marrow to make more platelets. Man-made drugs that mimic the effect of TPO are called TPO receptor agonists. There are three available:

- eltrombopag
- avatrombopag
- romiplostim.

Who might have TPO receptor agonists?

You might be treated with TPO receptor agonists if:

- your platelets are being destroyed by an antibody that attacks them ([immune thrombocytopenia](#))
- your platelet count hasn't responded to other treatments and
- you have a high risk of bleeding.

When you stop treatment, your platelet level might become low again.

How are TPO receptor agonists given?

Different TPO receptor agonists are given in different ways.

- You have eltrombopag as tablets or an oral solution that you take once a day. You should not have dairy foods or drinks, indigestion medicines, or vitamin or mineral supplements between 4 hours before and 2 hours after your dose.
- You have avatrombopag as tablets that you take with food at the same time every day.
- You have romiplostim as an injection under your skin once a week.

If you are having romiplostim, you – or a friend or family member – might be taught [how to inject yourself at home](#). Alternatively, a community nurse might visit you every day to give you your injections.

Side effects of TPO receptor agonists

Side effects of TPO receptor agonists include:

- sinus, throat or upper airway infections
- cough
- headache
- fatigue
- diarrhoea
- feeling sick
- joint or muscle pain.

Rarely, TPO receptor agonists can cause serious side effects such as blood clots. **If you develop a cough, chest pain, weakness or numbness, slurred speech or your arm or leg become red, swollen or painful, contact your medical team.**

TPO receptor agonists can affect how well your liver works. You have blood tests to monitor this.

A small number of people have an allergic reaction to TPO receptor agonists. **Contact your doctor urgently if you develop**

- **an itchy rash**
 - **swelling of your face, lips, tongue or throat**
 - **difficulty breathing**
 - **feeling faint.**
-

Having growth factors

You might have growth factors that you can take by mouth, or that you have as an outpatient at hospital. However, for some types of growth factor, you (or a friend or family member) might be taught to inject them yourself at home. This might seem daunting at first but it is much more straightforward than you might expect.

Having injections at home

If you are having injections at home, a healthcare professional will teach you how to do it. If you don't feel comfortable injecting yourself, they could teach a friend or family member to do it for you, or arrange for a community nurse to give you your dose.

You need to store growth factors in the fridge. Most come in single-use, pre-filled syringes. They are easy to give. Always check the expiry date before preparing your dose.

- Take a syringe out of the fridge about half an hour before each injection to make it a more comfortable temperature to inject. Note: Romiplostim does not come in a prefilled syringe. If you are having romiplostim injections at home, you will be taught how to prepare it for injection.
- Wash your hands thoroughly.
- Decide where you are going to inject. Your nurse should tell you what areas are safe to use. These are usually your tummy, the outside of your thighs or the top of your arms. Vary where you give the injections each day, so that an area doesn't become too sore or inflamed.
- Clean the skin you're going to inject with a sterile wipe. Your hospital should give you these.
- Open the syringe packet and uncover the needle.
- Pinch the skin you are going to inject, put the needle in, press the plunger and then pull the needle out.
- Dispose of the used needle and syringe carefully in a 'sharps bin'. Your hospital should give you this.

Cancer Research UK have a useful [video of how to give yourself an injection under your skin](#).

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References

The full list of references for this page is available on our website. Alternatively, email publications@lymphoma-action.org.uk or call 01296 619409 if you would like a copy.

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