

Growth factors

Growth factors encourage cells to divide and develop. You might have growth factors as part of your treatment for lymphoma to increase blood cell 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 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 be given growth factors?

Different growth factors encourage your body to make different cells. People who have lymphoma might need growth factors to help treat low blood counts.

There are three main types of cells in our blood; red cells, white cells and platelets. Different growth factors are used depending on which blood cell types are low.

- For **low white blood cells (neutropenia)**, a growth factor called granulocyte-colony stimulating factor (G-CSF) can tell 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.
- For **low red blood cells (anaemia)**, a growth factor called erythropoietin (EPO) can be used to tell your bone marrow to make more red blood cells.
- For **low platelets (thrombocytopenia)**, a growth factor called thrombopoietin (TPO) can be used to tell your bone marrow to make more platelets.

My blood cell count dropped after each cycle of chemotherapy and recovered a little before the next. My platelet level eventually crashed. I am one of Jehovah's Witnesses and my religious beliefs exclude using blood products. My medical team managed the platelet problem with growth factors: thrombopoietin (TPO), granulocyte colony stimulating factor (G-CSF), and erythropoietin (EPO). My platelet count came back to normal within a week and my problems with swelling in my feet and legs improved, meaning I could drive again, which made a huge difference to me.

Philip, who had growth factors as part of his treatment for mantle cell lymphoma

Growth factors for a low white blood cell count

A growth factor called granulocyte colony-stimulating factor (G-CSF) can be 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 lipegfilgrastim.

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

Who might have G-CSF?

G-CSF helps your neutrophil count (a type of white blood cell) 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**.

You might need G-CSF treatment if:

- you are having treatment, you have a low neutrophil (a type of white blood cell) count and your doctor thinks you are at high risk of developing a serious infection
- 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)
- 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).

Short-acting G-CSF is given 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.

Long-acting G-CSF is usually given 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 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.

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 in 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.

The G-CSF caused really bad hip and back pain, although that improved over time.

Adam, who had G-CSF as part of his treatment for nodular lymphocyte-predominant Hodgkin lymphoma

Growth factors for a low red blood cell count

A growth factor called erythropoietin (EPO) can be 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). EPO increases your haemoglobin level, transporting more oxygen around your body. This 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 usually have it

weekly. You – or a friend or family member – might be taught [how to inject yourself at home](#). Alternatively, a community nurse might visit you to give you your injections.

Side effects of EPO

The most common 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 if your arm or leg becomes 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 sometimes used to treat people who have a low platelet count ([thrombocytopenia](#)).

What is TPO?

TPO is a chemical messenger made in your liver. It tells your bone marrow to make more platelets, which are essential for stopping bleeding. 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
- you have a high risk of bleeding.

When you stop treatment, your platelet level might become low again. If this happens, your medical team will discuss your treatment options.

How are TPO receptor agonists given?

Different TPO receptor agonists are given in different ways.

- Eltrombopag is given 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.
- Avatrombopag is given as tablets that you take with food at the same time every day.
- Romiplostim is given as an injection under your skin once 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 to give you your injections.

Side effects of TPO receptor agonists

The most common side effects of TPO receptor agonists include:

- sinus, throat or upper airway infections
- 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 if your arm or leg becomes 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 be given growth factors in 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. Always check the expiry date before preparing your dose. They are easy to give:

- 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.

It may seem daunting to give yourself an injection, but they are easy and safe to give, and usually painless. Cancer Research UK have a useful [video of how to give yourself an injection under your skin](#).

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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