

## Growth Factors

### What are growth factors?

Growth factors are chemical messengers produced naturally in the body, which are able to stimulate the bone marrow (where blood cells are made) to manufacture the different types of blood cells. There are growth factors for all the different types of blood cells, red cells, white cells and platelets.

The growth factor for red cells is called erythropoietin or EPO. Growth factors for platelets are currently undergoing clinical trials but are not yet in routine use. Therefore, when we speak of growth factors in general, we usually mean growth factors for the white blood cells.

Mature white blood cells survive in the body for only a few hours or days, so there is a continual demand for them to be replaced. Growth factors (also known as colony stimulating factors) are produced in order to stimulate further production of these blood cells.

### Why are growth factors needed in myeloma?

One of the main side-effects of chemotherapy drugs used to treat myeloma is that they can cause a reduction in the number of white blood cells. White blood cells are an essential part of the body's immune system and help fight infection.

Neutrophils, also known as granulocytes, are an important type of white blood cell and are particularly affected by chemotherapy. A reduction in neutrophils may cause a condition known as neutropenia. Another type of white blood cell is a macrophage, which also help fight infection.

Myeloma patients may also have lower numbers of white blood cells as a result of myeloma cells crowding out the normal blood-producing cells in the bone marrow.

To increase numbers of white blood cells, and help reduce the risk of infections, synthetic growth factors have been developed in the laboratory. Examples of these include G-CSF (granulocyte CSF) and GM-CSF (granulocyte macrophage CSF). G-CSF is also used in patients who are having their stem cells harvested in preparation for high-dose therapy and stem cell transplantation. The G-CSF stimulates the bone marrow to produce more stem cells, making collection easier and usually more successful.

### How are they given?

Growth factors are normally given by injection under the skin (subcutaneously) in the thigh, abdomen or arm. A community / practice nurse or GP can give these injections, or alternatively the patient or a family member can be taught how to give them.

## How often are they given?

If growth factors are given because of a low white cell count they are usually given daily until the white blood cell count returns to normal (or a period of infection is over). After that the dose is either reduced or stopped. They are not usually given on a long-term basis.

To boost stem cells for collection prior to high-dose therapy and stem cell transplantation, G-CSF usually given once or twice daily for four to six days until the actual collection has taken place. If chemotherapy treatment is used as part of the stem cell mobilisation treatment, G-CSF is given following the chemotherapy, usually for about 10 days.

## What are the side-effects?

G-CSF and GM-CSF are well tolerated by most people.

The most common side-effects include:

- **Bone pain** This is due to the intense production of cells in the bone marrow. It is a sign that the drug is working and may require the use of simple painkillers such as paracetamol.
- **Pain at the injection site** This can be reduced if the solution is allowed to reach room temperature before injection.
- **Fever, chills, headache and general aches and pains** These can usually be managed by taking paracetamol.

## The future

New, longer-acting forms of growth factors are being developed, and a new form of G-CSF (PEG), which is administered on a one off basis, may be available soon. At the moment it is not possible to assess the impact of PEG G-CSF on current clinical use but it is likely to be significant.

## About this Infosheet

The information in this Infosheet is not meant to replace the advice of your medical team. They are the people to ask if you have questions about your individual situation. All Myeloma UK's publications are extensively reviewed by patients and healthcare professionals prior to publication.

## Other information available from Myeloma UK

Myeloma UK has a range of Essential Guides, Infoguides and Infosheets available, covering many areas of myeloma, its treatment and management. To order your free copies, contact the **Myeloma Infoline** on **0800 980 3332**. This information is also available 24/7 on our website at [www.myeloma.org.uk](http://www.myeloma.org.uk).

If you would like to talk to someone about any aspect of myeloma, its treatment and management, call the **Myeloma Infoline** on **0800 980 3332**. Your call will be answered by Myeloma Nurse Specialists who are supported by medical and scientific advisors. The Myeloma Infoline is open from Monday to Friday, 9am to 5pm, and is free to phone from anywhere in the UK. From outside the UK, call +44 131 557 3332 (charged at normal rate).

**Author:** Ellen Watters RGN, Myeloma UK  
**Issue date:** August 2008