



## INTERFERON ALPHA

### WHAT IS INTERFERON?

Interferon alpha is an immunotherapy drug. Interferons are substances which occur naturally in our bodies in small amounts. Our immune system produces interferons to help fight viruses, bacteria and tumours. Interferons are also used to treat all three main types of myeloproliferative neoplasms (MPNs): polycythaemia vera (PV), essential thrombocythaemia (ET) and myelofibrosis (MF).

### HOW INTERFERON WORKS IN MPNS

When given as medication, interferon suppresses production of blood cells and reduces spleen size. In some people it may also reduce bone marrow fibrosis and itching.

Interferon alpha is a man-made copy of a naturally occurring interferon. The drug increases interferon levels in your body, thus suppressing the overproduction of blood cells.

### TYPES OF INTERFERON ALPHA

Interferon prescribed in Australia is known under the brand name Pegasys®. Pegasys® is a long-acting formulation (pegylated-interferon of interferon alpha 2a) which is injected once a week and often less frequently (eg fortnightly or even less frequently). In Australia, Pegasys® is available in either 135 ug or 180 ug prefilled syringes. It is usually commenced at a dose of 45 ug weekly and the dose may be gradually increased or decreased depending upon tolerability and efficacy.

Some patients may be aware of a new longer acting form of pegylated interferon (alpha 2b) available in Europe and the USA known as ropeginterferon (sold as Besremi), however this is not available in Australia.

### HOW CAN INTERFERON TREAT MY MPN?

Interferon alpha is currently recommended as an option for first-line therapy for people with essential thrombocythaemia or polycythaemia vera in whom cytoreduction is indicated. It is recommended as one of the second-line options in patients refractory or intolerant to first-line hydroxycarbamide. It is usually the cytoreductive agent recommended for younger people with MPNs and women with MPNs who are pregnant or trying to become pregnant.

Several small studies have used interferon, most often pegylated-interferon, for treatment of primary myelofibrosis (PMF) and observed both clinical and histological responses. Pegylated-interferon is more likely to be used in patients with low risk PMF, where reduction in blood counts and thrombosis risk is the main aim of treatment. For intermediate and high risk PMF patients with bulky splenomegaly or a high symptom burden, therapy with ruxolitinib is more likely to be recommended.

Whether interferon is appropriate will vary between patients and is best discussed with your haematologist. Links to the latest information are available on the MPNAA website at <https://www.mpnallianceaustralia.org.au/articles-on-treatments/>.

Interferon has been shown to:

- Normalise elevated blood counts (red cells, white cells and platelets)
- Reduce spleen size
- Reduce the incidence of thrombosis (clotting)
- It may reduce fibrosis in some patients
- Reduce itching in some people
- Reduce the allele burden of driver mutations (JAK or CALR) in some patients.

Patients need frequent blood tests and monitoring whilst taking interferon to ensure correct dosage.



## ARE THERE ANY SIDE EFFECTS?

Whilst interferon is an effective treatment for MPNs, this treatment does not suit everyone – some people may not tolerate the side effects they experience. Approximately 20% of people who begin treatment with interferon eventually stop taking it due to side effects. **However, many people report that side effects they initially experience reduce over time, allowing them to tolerate ongoing treatment.**

**Most patients tolerate interferon well especially if commenced at a low dose and gradually increased.**

### Monitoring of possible side effects

The Australian [Recommendations for use of pegylated IFN-a in the treatment of classical myeloproliferative neoplasms](#) state that 'once normalisation of blood counts is achieved, the dose of interferon may be tapered to the lowest dose that maintains normal blood counts.'

The recommendations provide more detail on monitoring of possible side effects such as thyroid, low lymphocytes, low platelets etc. It is recommended that the thyroid should be checked at least annually but possibly more frequently for women, especially in the first year of treatment.

For patients transitioning from hydroxycarbamide to pegylated-interferon, close monitoring of blood counts (e.g. fortnightly or monthly) is required so that the dose of hydroxycarbamide can be weaned as the dose of pegylated-interferon is gradually increased.

For patients who have not previously been on cytoreductive therapy, blood counts should be monitored closely initially (e.g. fortnightly or monthly) and the frequency of testing reduced once blood counts normalise and the dose of pegylated-interferon has stabilised.

Monitoring of blood counts and biochemistry on at least a 3-monthly basis indefinitely is recommended for all patients.

### Important

A list of side effects is outlined below. It is not fully comprehensive and some other unusual side effects can occur. It is important patients inform their doctor if they experience any side effects described, no matter how mild. There are often ways of overcoming side effects or reducing them to a tolerable level.

Anecdotal feedback from patients' experience is that commonest significant side effects are often flu-like symptoms with the first few doses, fatigue, mild nausea, muscle and joint aches and occasionally depression. Some of these can be managed with temporary support in the expectation that they will improve with time (typically the flu-like symptoms), others may need either dose adjustment or changes in lifestyle (eg fatigue), while others may require cessation of the drug (eg significant depression).

It may also be worth having your eyes checked with an optometrist if you have an MPN and before you start on Pegasys® as a baseline check. While extremely rare, the Pegasys® leaflet refers to some possible rare ocular side effects that should be monitored, especially for those with existing retinopathy.

**Very common side effects** - affect approximately 10% of patients taking interferon

- Flu-like illness; reduced appetite; temperature; rigors/shivering; fatigue
- Reduced white blood cells
- Loss of appetite/ mild nausea
- Mild headache
- Mild diarrhoea
- Hair thinning/ loss (reversible)
- Joint and muscle pain/discomfort
- Injection site - mild redness after each injection (which tends to diminish after using interferon for a few months)



**Less common side effects** - affect approximately 1-10% of patients taking interferon

- Chest pain
- Fluid retention/ swelling
- Reduced platelets and/or red blood cells
- Mood disturbance which can include depression, anxiety, sleep disorders
- Taste changes
- Palpitations
- Nausea and vomiting
- Abdominal pain
- Dry mouth

**Uncommon side effects** - affect less than 1% of patients taking interferon

- Dehydration
- Tingling/numbness in hands, legs and feet
- Dizziness
- Visual disturbances
- Protein in urine
- Thyroid dysfunction

The above list is not fully comprehensive and some other side effects can occur. Please consult the official product information if you are experiencing any side effects and it is important that patients inform their doctor if they do experience any side effects.

## TAKING INTERFERON

Your doctor will give you instructions and demonstrate how to inject interferon. Most people inject themselves, as it is straightforward. Help from haematology nurses at your treating hospital or local doctor can be obtained, if required. If you do not feel confident, a relative or friend can be taught to inject you.

**Two videos on how to inject interferon are available at MPN Alliance Australia's website. They cover all aspects of managing interferon injections and are very useful to watch before your first interferon injection.** <https://www.mpnallianceaustralia.org.au/understanding-mpn/treatments/interferon-alpha/>

## Dosage

**Pegylated-interferon is better tolerated if it is started at a low dose (usually 45 ug weekly) in the evening.** Patients should take paracetamol 30 mins prior to their first injection and regularly for the first few days to dampen the flu-like symptoms that are common with the first few doses of interferon. The dose should be increased gradually depending upon tolerability and efficacy. Your doctor will provide specific dosage recommendations. Please be sure to follow directions precisely.

**Non-compliance** - It is important that you follow the directions precisely. Failure to do so may increase your risk of vascular and thrombotic disease related complications.

## Storage and disposal of interferon

- Store in a fridge between 2-8°C. DO NOT FREEZE. Keep syringe and needles in their outer cartons to protect from light. Keep separate from food by placing in a plastic container.
- Keep medication and syringes in a secure location, well out of reach of children and pets.
- You will need to use a sharps bin to dispose of your needles once you have used them. These can be obtained from the pharmacy when you collect your Pegasys® prescription. Please check if you can return full sharps bins back to your hospital, GP's surgery or pharmacy. Some recycling facilities have sharps bin containers. Do not return used needles in a container that could cause an injury to others.
- Return any unused medication and syringes to your local pharmacy or hospital.
- Do not dispose of medication or syringes, new or used, in the bin. Do not flush down the toilet.



## Keeping track

Some patients find it helpful to keep a record to remember when to take your medication (eg medication reminder app on a smart phone) and record any side effects.

## First dose: what should I expect?

- Ensure you have any equipment needed laid out in front of you including your syringe, needle, sharps bin and instructions. Do not rush.
- If you are worried or unsure about the injection you may be able to arrange to give it in the presence of a qualified nurse.
- Take your first dose in the evening, because side effects can start within several hours of your first dose. Taking your first dose late in the day will allow you to sleep through any of the common initial 'flu-like' side effects such as a chills or fever.
- Take two 500mg paracetamol tablets prior to injecting interferon and every 6-8 hours for the first 24 hours to reduce flu-like symptoms you may experience. Paracetamol can be ceased once flu-like symptoms are gone but should be recommenced with any dosage increase and continued until the higher dose is tolerated without side-effects. Although flu-like symptoms usually last only 24 hours some people can experience them for several days. **On the other hand, many patients rarely if ever experience flu-like symptoms and so have no need to take paracetamol.**

## How fast does it work and how will I feel?

The time for interferon to have a noticeable effect on your blood results varies, however it usually takes a minimum of two to four weeks. As your blood counts reduce you may notice your symptoms improving. Any initial side effects experienced often reduce over a period of time.

## What if I bleed after having an injection?

A small drop of blood at the injection site immediately after injecting is nothing to worry about. Your skin has tiny blood vessels just below the skin and you may have nicked these vessels with the needle. Continuous bleeding or heavy bruising at the injection site should be checked by a nurse or doctor.

## INTERACTIONS WITH OTHER MEDICATIONS OR VITAMINS, HERBAL SUPPLEMENTS OR REMEDIES

Whenever you take interferon (or in fact any medication), always provide the names of other medicines prescribed for you as well as any over-the-counter medications (e.g vitamins, herbal supplements or remedies) to the health care team who are treating you. It can be very helpful to carry a list of the names and dosages of all your medicines to show to your haematologist at appointments.

You must tell your doctor if you are taking theophylline (a medicine used in treatment of asthma, bronchitis, emphysema & related conditions) as you may need to take a different dose of interferon. Your doctor will advise you. Your doctor or pharmacist has more information on medicines to be careful with or avoid while using interferon. Ask your doctor or pharmacist if you are unsure.

[The MPN AA has a wallet card which provides for medications to be listed.](#)



## TIPS FOR COPING WITH COMMON SIDE EFFECTS

### Flu-like symptoms

(including fever and chills, headache, aches and pains, cough and congestion)

- Take the injection shortly before you go to bed.
- Drink plenty of water.
- Consider paracetamol as discussed above under “Your first dose”.
- If your fever is over 38°C and has not reduced with paracetamol contact your doctor.
- Avoid excessive alcohol or caffeinated drinks prior to taking your injections.
- A warm bath, massage or hot pack may help with aches and pains.
- Report any new aches, pains or significant cough since starting interferon to your doctor.

### Lack of energy and fatigue

- Try to keep a regular daily routine to your day, listen to your body, and do not push yourself to complete activities or tasks if it feels too much for you.
- Take a short (40 minute) nap during the day, but not too late in the day as this may affect your sleep at night. Too much sleep can increase fatigue.
- Prioritise activities; ask for help with tasks that you do not have the energy to complete. Try to exercise regularly. If you have not previously exercised, do not over-exercise; take it gently and for short periods until you feel able to increase the duration

### Nausea, loss of appetite and taste changes

- Eat small amounts often instead of three large meals a day.
- If you feel nauseous, avoid- fast food, food with strong flavours, or spicy, sweet, acidic or greasy food.

### Mood changes

It is important to monitor yourself for mood changes. If you have significantly low mood, if you lose enjoyment of activities that usually give you pleasure or are frequently experiencing low mood or tearfulness, you should report this to your doctor.

## FREQUENTLY ASKED QUESTIONS

### Frequency of follow up tests

You will need more frequent blood tests during the first weeks of treatment to determine how your body is responding to the medication. Once your body has adjusted you will need less frequent checks, perhaps once every two to three months. Your kidney, thyroid and liver function may also be checked with blood tests at the same time.

Dose adjustments according to side effects and response to therapy are common. Eg, patients responding well may require injections less frequently (eg Pegasys® once a fortnight, or monthly rather than weekly), or a lower dose. Conversely, others may require an increase in dose if their response is not adequate.

### What if I have other medical conditions?

All medications have potential risks and side effects. You should advise your haematologist of any other medical conditions you may have. Interferon alpha should be used with caution, (if at all), if you have any of the following conditions:

- An allergy to any ingredients in the interferon
- Severe heart problems or a history of heart problems
- Significant kidney problems or liver problems
- Seizures (epilepsy) or other nervous conditions
- Psychiatric illness or difficulties (current or past)
- An auto immune disease such as thyroid dysfunction, psoriasis or vasculitis
- Certain eye conditions



- Heart/lung/liver or other organ transplant
- Diabetes
- Hepatitis C
- HIV and are treated with HIV medicines
- Blood clotting disorder

If you think you may have one of these conditions please discuss with your doctor. This may not mean you cannot have interferon, but it should be used with caution.

### **What do I do if I forget a dose?**

If you have forgotten a dose, take it as soon as you remember but do not take two doses on the same day.

### **Can I eat and drink normally?**

Yes. We recommend a normal healthy diet and drinking plenty of water.

### **Can I drink alcohol?**

While it is usually safe to drink alcohol in moderation whilst taking interferon, Australian NHMRC guidelines state that for healthy women and men drinking no more than two standard drinks on any day reduces your risk of harm from alcohol-related disease. Alcohol can cause dehydration and it is important to avoid becoming dehydrated if you have an MPN. You are advised to discuss any alcohol consumption with your doctor when you are being treated with interferon.

### **What if I want to have a child?**

Whilst it is safe to conceive or father a child whilst taking interferon it is recommended you discuss any plans you have to conceive with your doctor. Inform them as soon as you find out you or your partner is pregnant.

### **Can I breastfeed while taking interferon?**

Whilst it is known that interferon transfers into breast milk in small amounts, there has to date been no reports of adverse effects on babies. The decision to breastfeed your baby whilst using interferon should be made by balancing benefits against risk. Your haematologist and maternity team can help you make this decision.

### **Can I drive?**

You may find that when you begin taking interferon that your ability to drive and operate machinery is affected. We recommend when you begin taking this medication that you wait to see how you react before deciding if you are able to drive.

### **Can I travel whilst taking interferon?**

Yes! We recommend you discuss travel plans with your doctor prior to travelling. Ensure you have suitable travel insurance and sufficient medication to take with you. Most airlines require a covering letter from your doctor to take injections on board. We advise you to check when you book your flight. Keep injections in your hand luggage, as the temperature in the hold may not be appropriate. You will need to ensure your interferon is stored at the correct temperature. One way of keeping your interferon cold is to carry it in a coolbag with a cold pack, however you need to ensure you do not freeze it. Some airlines may offer to refrigerate it for you – ask as you go on board.

Fridge To Go has a number of medical travel wallet products at [www.fridge-to-go.net.au](http://www.fridge-to-go.net.au).

### **How do I dispose of my sharps bin once it is full?**

Please ensure that full sharps bins are properly closed. Ask if you can return full bins to the hospital or surgery that provided it to you. Do not use a bag or any other container apart from a sharps bin to return used syringes as this is dangerous and may not be accepted.



### Can I have vaccinations such as the flu and COVID-19 jabs while taking interferon?

You can have most vaccinations, including the flu and COVID-19 vaccines, whilst taking interferon. It is not recommended that you take any live vaccines, - e.g. measles, mumps and varicella virus (shingles) vaccines – although you can have the Shingrix vaccination for shingles - and these should not be taken with interferon. It is always advisable to consult your doctor prior to having a vaccination. Your medical team will check your overall health and immune system status prior to vaccination to ensure that vaccination is safe for you.

### COVID-19 - Can I take antivirals while on interferon?

If you test positive for COVID-19, you may be eligible for antiviral treatments. The antiviral most suitable for you will depend on what MPN and other medications you are taking and your kidney function. Treatment must be commenced within 5 days of symptom onset, or as soon as possible if you have no symptoms but test positive. Please contact your GP or haematologist to arrange antiviral therapy immediately if required.

### If you need to have a medical procedure or operation?

It is important that you inform the doctor or dentist planning the procedure or operation that you are taking interferon and that they discuss plans for your procedure with your haematology doctor.

## WHAT CAN I DO TO HELP MYSELF?

It's important to take good care of yourself. There are many things you can do to feel better.

- **Don't neglect your general health, particularly your cardiovascular health including stopping smoking and managing your cholesterol.** It is a good idea to have regular physical checkups, including skin checks, eye health examinations and screening tests for mammograms, cervical cancer and prostate cancer.
- **Be blood clot aware.** Having an MPN puts patients at higher risk of having a blood clot. It's good to know the signs and how to prevent blood clots. See STOP THE CLOT website at: [https://www.stopthecLOT.org/learn\\_more/signs-and-symptoms-of-blood-clots/](https://www.stopthecLOT.org/learn_more/signs-and-symptoms-of-blood-clots/)
- **Have regular skin cancer check ups for both melanoma and non melanoma skin cancers,** especially if you are also on treatment regimes such as hydroxycarbamide (hydroxyurea) or ruxolitinib
- **Good nutrition is important.** Eat a balanced diet including lots of fresh fruit and vegetables, lean protein and whole grains.
- **Drink plenty of water and prevent dehydration** by avoiding excessive alcohol and caffeinated drinks.
- **Maintain a normal weight and maintain your muscle mass** to help keep your cholesterol and blood sugar within normal limits.
- **Exercise is very beneficial** for people with MPNs and helps to fight fatigue. Before starting on any new programme, check with your GP or haematologist and start slowly and gently.
- **Stop smoking.** Ask your GP if you need help.
- **Consider wellness activities** such as yoga, aerobic activity, strength training, meditation, massages, support groups, improved nutrition etc – an international study of hundreds of MPN patients showed wellness activities had a pattern of decreased levels of symptom burden, fatigue, depression, and a higher quality of life for MPN patients. (Survey of integrative medicine in myeloproliferative neoplasms – the SIMM study).

More information on living well with an MPN is available at [www.mpnallianceaustralia.org.au](http://www.mpnallianceaustralia.org.au).

## GENERAL ADVICE

This leaflet is intended to give you general information about taking interferon, or as a reference for people already taking this medication. It is important that in addition to this leaflet you read the product information available from your pharmacist about interferon and discuss any concerns with your general practitioner or haematologist.