

*If you have any questions about your medications, ask your physician or pharmacist.*

## Lung Transplant Medications

A major concern after transplant surgery is the risk of organ rejection. Rejection happens when your body stops accepting your new organ. Your immune system attacks your new organ because it thinks the organ does not belong in your body. This damages your new organ.

Rejection can happen at any time — even years after your transplant.

### Taking your medications

**The most important thing to know is that you will need to take medications for the rest of your life.** The anti-rejection medications work together to suppress your immune system and prevent rejection. This is why you must **always** take your medications.

Take your medications every day at the same times.

Keep track of your medication dosages as they change. There may be times when the directions on your prescription bottle are no longer accurate. The directions on your medication list or that your transplant nurse coordinator tells you will be the most up to date.

### Preventing infection

Anti-rejection medications weaken your immune system. This can make you more likely to get infections. You will have to take certain medications to help protect you from getting these infections.

You will also need to take certain precautions to avoid infections:

- Wear a mask in crowded areas.
- Wash your hands often.
- Stay away from people who are sick.

### Laboratory blood work

You will need regular laboratory blood testing to check some of the medication levels in your blood. Your care team will use the results of your blood tests to:

- Check how well the medications are working
- Watch for signs of organ rejection
- Lessen your chances of side effects and infections

## Do not miss any lab appointments.

### *How to avoid extra blood draws and trips to the lab*

The 2 most common reasons for extra blood draws are:

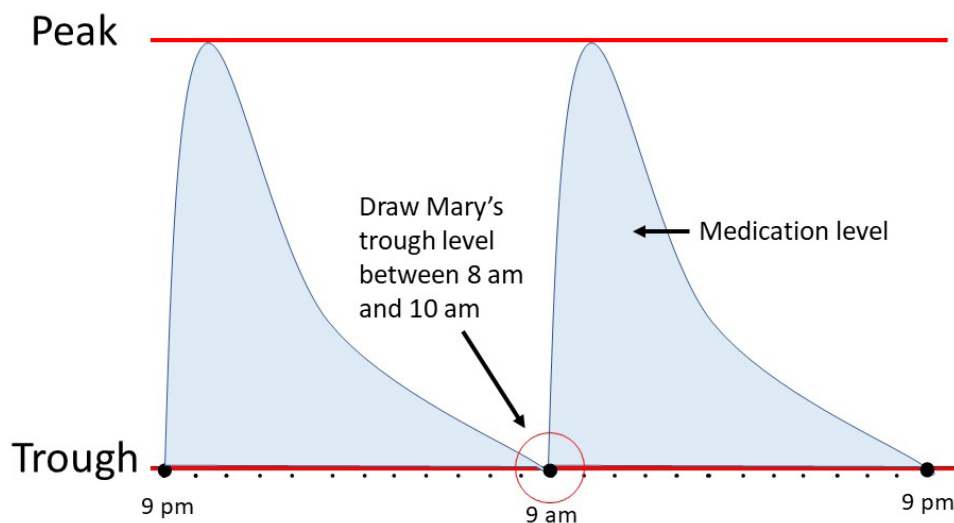
- Getting blood drawn too late in the day
- Taking your medication right before your blood draw

We measure some of your important medications by drawing a “trough” level. This means we measure the amount of medication in your blood when it is at the lowest level. Then, we can adjust your medication dose, as needed.

The medication is at its lowest level right before you take your next dose.

- If you take a medication every 12 hours, the trough level will be 11 to 13 hours after your last dose.
  - Example: Mary took tacrolimus at 9 pm. She can have her blood drawn between 8 am and 10 am (Figure 1). After the blood draw, Mary will take her morning tacrolimus.

**Figure 1.**



- If you take a medication 1 time a day, the trough level will be 23 to 25 hours after your last dose.
  - Example: Jack took his posaconazole (Noxafil®) at 10 am on Tuesday. Since he only takes this medication once a day, he can have his blood drawn the next day (Wednesday) between 9 am and 11 am. After the blood draw, Jack will take his morning posaconazole (Noxafil).

If you take your medication right before your blood draw, we will need to do another blood draw at a trough time.

## Medication refills

Get your refills on time or early so you do not run out of medications. Request refills on your medications 5 to 7 days before you will run out of medication. If you will run out of your medications before you are able to get a refill, contact your transplant nurse coordinator.

### *How to get a refill*

Call the pharmacy directly first to see if you have any refills left on the prescription. You can also check your MyNM patient portal (Menu > My Record > Medications).

**If you need an urgent refill request (if you will run out of medication within 24 hours), please call the Transplant main office at 312.695.5864 right away.**

If no refills are left on the prescription, use 1 of these options:

- Ask for a refill through the MyNM<sup>®</sup> app. This is the best option since your request goes directly to your electronic medical record and tells your clinician to reorder it. Do this at least 5 to 7 days before you run out of the medication.
- Ask the pharmacy to request a refill. However, there can be delays if they have the wrong fax number (312.926.4100) for the Transplant office.
- Call or send a message through MyNM to your transplant nurse coordinator.
- Call the Transplant main office at 312.695.5864 (TTY: 711).

Please request refills Monday through Friday, 8:00 am to 4:30 pm.

Allow 24 to 48 business hours for refill requests to be processed.

## Anti-rejection medications

Anti-rejection medications reduce your immune system's ability to reject the transplanted organ. You will take anti-rejection medications for the rest of your life. Your care team will prescribe the medications that are right for you. They will check for side effects and blood levels often. They will manage your side effects, as needed.

## Anti-rejection medications

The most commonly used anti-rejection medications are shown in gray.

Generic name	Brand name	Common side effects	Blood level monitoring
Tacrolimus	Prograf® (immediate release) Envarsus® (extended release)	Hand tremors, headaches, high blood glucose (blood sugar), increased potassium, low magnesium, high blood pressure, kidney problems	Yes
Cyclosporine, modified	Neoral® Gengraf®	Swollen gums, higher blood pressure	Yes
Mycophenolate	CellCept® Myfortic®	Low blood counts, diarrhea, nausea, vomiting There is a risk of birth defects and miscarriage if you take this medication during pregnancy.	No
Azathioprine	Imuran®	Low blood counts	No
Sirolimus	Rapamune®	Problems with wound healing, mouth sores, increased cholesterol	Yes
Everolimus	Zortress®	Problems with wound healing, mouth sores, increased cholesterol	Yes
Prednisone	--	Problems with wound healing, high blood pressure, stomach upset, increased white blood cells, increased appetite, insomnia, fluid retention, swelling, high blood glucose (blood sugar), weight gain (with long-term use), osteoporosis (with long-term use)	No
Dexamethasone	--	Problems with wound healing, high blood pressure, increased white blood cells, increased appetite, insomnia	No

### ***Tacrolimus (Prograf)***

#### **Instructions:**

- Take the prescribed number of capsules 2 times each day (12 hours apart) unless your care team tells you otherwise.
- Do not take tacrolimus with grapefruit and pomegranate juices. Doing so can increase the tacrolimus level in your blood.

#### **Lab day alert:**

- **Do not take your tacrolimus morning dose before getting your blood drawn.**
- Take it **after** your blood draw. It is OK if you take your medication later than usual on those days after your blood is drawn.

### ***Mycophenolate (Cellcept, Myfortic)***

#### **Instructions:**

- Take the prescribed number of capsules 2 times each day (12 hours apart) unless your care team tells you otherwise.
- You can take it at same time as other medications.
- Take it with food (small meal or snack) to lessen stomach upset.
- Talk with your transplant physician about family planning and contraception methods if you are able to become pregnant or want to become pregnant. If you take mycophenolate while pregnant, you have a higher risk of miscarriage and birth defects.

### ***Prednisone***

#### **Instructions:**

- Take the prescribed number of tablets once a day in the morning.
- You can take it at same time as other medications.
- Take it with food (small meal or snack) to lessen stomach upset. This may happen at higher doses. Your dose will be gradually decreased over time (to 5 milligrams daily).

## Infection prevention medications

Since your body's immune system is suppressed (immunosuppressed), you may be more susceptible to bacteria, viruses or fungus in the environment. Your care team will prescribe some medications to help protect you from these types of infections.

Generic name	Brand name	Common side effects	Blood level monitoring	How long you will take it after your transplant
Valganciclovir Valacyclovir	Valcyte® Valtrex®	Decreased blood counts in some people	No	3 to 12 months
Posaconazole Voriconazole Isavuconazole	Noxafil® Vfend® Cresemba®	Toxic to the liver, vision problems	Yes	6 months (may be longer or lifetime for some people)
Sulfamethoxazole -trimethoprim	Bactrim®	May make you more sensitive to the sun and prone to sunburns	No	Lifelong

### ***Valganciclovir (Valcyte) or valacyclovir (Valtrex)***

**What it does:** Treats or prevents viral infections such as cytomegalovirus or herpes simplex virus.

**Instructions:** Take 1 or 2 tablets, as directed, 1 time a day in the morning unless your care team tells you otherwise.

### ***Posaconazole (Noxafil)***

**What it does:** Treats or prevents fungal infections.

**Instructions:** Take prescribed number of tablets 1 time a day in the morning (unless otherwise told).

**Lab day alert:** We check both the drug levels and your liver function to manage the risk of liver damage.

- Do not take posaconazole before getting your blood drawn.
- Take it after your blood draw. It is OK if you take your medication later than usual on those days after your blood is drawn.

### ***Sulfamethoxazole-trimethoprim DS (Bactrim, SMX/TMP)***

**What it does:** Treats or prevents bacterial infections and a specific type of fungal pneumonia.

**Instructions:** Take 1 tablet 3 times a week (Monday, Wednesday, Friday)  
It may make you more sensitive to the sun and prone to sunburns. Wear sunscreen. Stay out of the sun when the sun's rays are strongest between 10 am to 2 pm.

### ***Antibiotics before dental procedures***

You must take an antibiotic before any dental appointments (even routine cleanings) to prevent infection during your 1st year after the transplant. The antibiotic will depend on the type of procedure(s) you will be having.

Call your transplant nurse coordinator or the Transplant main office if you have a dental appointment or procedure scheduled.

### **Other medications after transplant**

You may also start taking other medications right after surgery such as vitamin supplements, pain relievers and stool softeners.

<b>Generic name</b>	<b>Brand name</b>	<b>What it does</b>
Azithromycin	Zithromax®	Works to decrease inflammation and prevent long-term rejection in your lungs. It is a lifelong medication.
Pantoprazole Omeprazole Lansoprazole	Protonix® Prilosec® Prevacid®	Reduces stomach acid to help prevent stomach ulcers and damage to transplanted lungs from heartburn.
Senna-Docusate Polyethylene Glycol	Senexon-S® Miralax®	Helps bowel movements to prevent constipation.
Acetaminophen	Tylenol®	Pain reliever to be taken as needed.
Calcium-Vitamin D	Oysco®	Vitamin supplement to help improve bone strength.
Magnesium oxide	Mag-Ox®	Mineral supplement to replenish blood levels.

### ***Pain medications after transplant***

Pain medication is usually only needed right after surgery.

The only recommended over-the-counter pain medication after transplant is acetaminophen (Tylenol). You can take it as needed according to the directions on the label. Do not take more than 3,000 milligrams (mg) of acetaminophen in 24 hours.

Do not take non-steroidal anti-inflammatory drugs (NSAIDs) after your transplant. This includes:

- Ibuprofen (Advil®)
- Naproxen (Aleve®)

Your care team may prescribe stronger pain medications, such as oxycodone or tramadol, after your transplant if you need it to manage your pain.

## Common side effects from transplant medications

Some transplant medications may cause some of these side effects.

### ***Acute kidney injury***

Cause: Medications such as tacrolimus

You may need to go to the Emergency Department, depending on your lab results.

### ***High potassium level***

Cause: Some medications such as tacrolimus and sulfamethoxazole-trimethoprim

You may need to go to the Emergency Department, depending on your lab results.

A high potassium level may not have any symptoms.

### ***Low magnesium level***

Cause: Some medications such as tacrolimus

If you have low levels of magnesium, your care team will prescribe a magnesium supplement. However, increasing a magnesium supplement can result in nausea and diarrhea.

### ***Tremors***

Cause: Tacrolimus

Symptoms include uncontrollable shaking, usually most noticeable in the hands. The tremors can get worse or better at different times of the day. Tremors may improve with time after the transplant. Your care team will try different treatments to help as needed.

### ***Hair loss***

Cause: Tacrolimus

You can try supplements, such as biotin, to help with hair regrowth. Sometimes these do not work. **Talk with your transplant nurse coordinator before you take any over-the-counter supplement (vitamin, mineral, herbal product) or medication.**

### ***Nausea, vomiting and/or diarrhea***

Cause: Medications such as mycophenolate

Please call your transplant nurse coordinator or the Transplant main office if you have nausea that does not go away, vomiting or diarrhea (3 or more loose bowel movements in a day).

### ***Low white blood cell count and/or absolute neutrophil count***

Cause: Medications such as mycophenolate and valganciclovir

Your care team can treat this by reducing the medication dose, using a different medication or prescribing an injectable medication to increase white blood cell counts (Granix).

### ***High blood glucose***

Cause: Medications such as prednisone and tacrolimus

Symptoms include increased thirst and frequent urination. Not all patients have these symptoms.

High blood glucose may improve as your steroid dose decreases, though some patients may need lifelong therapy (such as oral medications or insulin) to manage high blood sugar.



### ***Numbness, tingling, and pain in hand and/or feet (neuropathy)***

Cause: Some medications or medical conditions such as diabetes

Your care team can prescribe medications to help with the discomfort and pain.

### **How to give an injection**

You may need an injection of certain medications, such as tbo-filgrastim (Granix, Neupogen, Zarxio). Filgrastim is a treatment for low levels of neutrophils, a type of white blood cell. This can be a side effect from some of the anti-rejection medications such as mycophenolate and valganciclovir.

To give an injection, follow these instructions:

#### ***Gather the materials.***

- Prefilled medication syringe with a clear plastic needle guard attached
- Alcohol pad
- Disposable sharps container or other puncture-resistant container, such as a laundry detergent bottle
- 2-inch x 2-inch gauze pad or cotton ball
- Bandage (such as a Band-Aid®)

#### ***Get the injection ready.***

- Take the prefilled syringe out of the refrigerator 30 minutes before you give the injection so that it can reach room temperature.
- Prepare a clean area to work where you can lay out all of your materials. You can work in your bathroom if it is private and there is enough space.
- Do not shake the syringe. Shaking it can damage the medication. If it has been shaken and the medication looks foamy, do not use it.

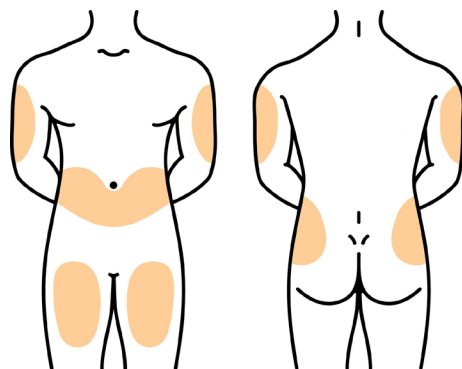
#### ***Check the medication.***

- Name – Make sure the medication name on the package or syringe label matches what the physician prescribed.
- Expiration date – Make sure the expiration date on the syringe has not passed. If the date has passed, throw away the syringe in the sharps container.
- Strength – Make sure the strength of the medication is what the physician prescribed. The strength is listed on the colored dot on the package.
- Color – Make sure the medication in the syringe is clear and colorless. Do not use it if it looks discolored, cloudy or has crystals in it.

#### ***Choose an injection site from one of the following areas (Figure 2).***

- The outer area of the upper arms
- Abdomen (belly), except for the 2-inch area around the belly button
- The middle of the front of the thighs
- The upper areas of the buttocks

**Figure 2. Injection sites**



- Keep track of which site you used last. Use a different site each time. This can help so 1 site does not get sore.
- Do not inject into an area that is tender, red, bruised or hard.
- Do not inject into an area that has scars or stretch marks.
- Fold back any clothing that is covering the injection site.

***Prepare the alcohol pad.***

Tear off any 3 edges on a sealed alcohol pad packet. Hold the packet at the edge you did not tear. Carefully open the packet to expose the alcohol pad, but do not take the pad out. Set the open packet on your clean work area. You will use this alcohol pad to clean the skin at the injection site just before you give the injection.

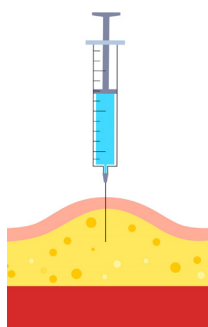
***Give the injection***

1. Wash your hands well with soap and water or use an alcohol-based hand sanitizer.
2. Take the syringe out of its package and remove the needle cover.  
To do this, hold the syringe around the middle, like a pen or dart. Carefully pull the needle cover straight off. Once the needle cover is off, do not set the syringe down. Do not let anything, including your fingers, touch the needle. If anything touches the needle, throw it out in the sharps container. Call your physician or nurse for instructions on what to do next.
3. Check the syringe for air bubbles.  
If there are air bubbles, hold the syringe upright (with the needle pointing up). Gently tap the syringe with your fingers until the air bubbles rise to the top of the syringe, near the needle. Slowly push the plunger up to force the air bubbles out of the syringe.
4. Clean the injection site with the alcohol pad.  
Pick up the alcohol pad with your other hand. Using firm pressure, clean the skin on the injection site. Start at the center of the site and move outward in a circular motion. Let the skin dry before giving the injection.
5. Pinch a fold of skin at the injection site.  
Hold the syringe in your dominant hand (the hand you use to write). Hold it like you would a pen or a pencil when you are ready to write. Use your other hand to pinch a fold of skin at the injection site.

6. Insert the needle into the skin.

Do this in 1 quick motion at a 90-degree angle (straight up and down) (Figure 3).

**Figure 3: Inserting the needle**



Do not put your thumb on the plunger yet. After the needle is in the skin, let go of the skin.

7. Inject the medication.

Use your thumb (whichever thumb is more comfortable) to slowly push the plunger all the way down. Push it until the syringe is empty.

8. When the syringe is empty, pull it straight out of the skin.

9. Put the cotton ball or gauze over the injection site and press down for several seconds. If needed, put the bandage over the injection site.

### ***How to throw the syringe away***

Do not put the cover back on the needle. Be careful to not poke yourself with the needle. While holding the clear plastic finger grips on the sides of the syringe with 1 hand, grasp the needle guard with your other hand. Slide the needle guard over the needle until it is completely covered. You will hear the needle guard click into place.

Put the syringe and cover into the sharps container. Do not use a prefilled syringe more than 1 time.

After an injection of filgrastim you may feel these symptoms:

- Bone and joint pain
- Fever
- Increased bleeding/bruising

**If you have any questions about your medications, ask your physician or pharmacist.**