

Cyclophosphamide IV Formulation (Cytoxan®, Neosar®, Endoxan®)

Pronounce: SYE-kloe-FOS-fa-mide

Classification: Alkylating Agent

About Cyclophosphamide IV Formulation (Cytoxan®, Neosar®, Endoxan®)

Cyclophosphamide kills cancer cells through a process called alkylation. Alkylation damages the DNA of cells, which prevents them from dividing and causes them to die. Since cancer cells tend to divide faster and with less error correcting than healthy cells, cancer cells are more sensitive to this damage.

How to Take Cyclophosphamide

Cyclophosphamide can be given by intravenous (IV, into a vein) infusion or taken orally (by mouth) in a pill form. This information is about the IV formulation. Your dose and schedule are determined by your size and type of cancer being treated.

This medication can interact with a number of medications including: metronidazole, tamoxifen, warfarin, cyclosporine amiodarone, Echinacea, and thiazide diuretics, among others. Be sure to tell your healthcare provider about all medications and supplements you take.

Possible Side Effects

There are a number of things you can do to manage the side effects of cyclophosphamide. Talk to your care team about these recommendations. They can help you decide what will work best for you. There are some of the most common or important side effects:

Infection and Low White Blood Cell Count (Leukopenia or Neutropenia)

This medication can cause life threatening infections, with or without a decrease in white blood cell counts.

White blood cells (WBC) are important for fighting infection. While receiving treatment, your [WBC count can drop](#), putting you at a higher risk of getting an infection. You should let your doctor or nurse know right away if you have a fever (temperature greater than 100.4°F or 38°C), sore throat or cold, shortness of breath, cough, burning with urination, or a sore that doesn't heal.

Tips to preventing infection:

- [Washing hands](#), both yours and your visitors, is the best way to prevent the spread of infection.
- Avoid large crowds and people who are sick (i.e.: those who have a cold, fever or cough or live with someone with these symptoms).
- When working in your yard, wear protective clothing including long pants and gloves.
- Do not handle pet waste.
- Keep all cuts or scratches clean.
- Shower or bathe daily and perform frequent [mouth care](#).

- Do not cut cuticles or ingrown nails. You may wear nail polish, but not fake nails.
- Ask your oncology care team before scheduling dental appointments or procedures.
- Ask your oncology care team before you, or someone you live with, has any vaccinations.

Low Red Blood Cell Count (Anemia)

Your red blood cells are responsible for carrying oxygen to the tissues in your body. When the [red cell count is low](#), you may feel tired or weak. You should let your oncology care team know if you experience any shortness of breath, difficulty breathing or pain in your chest. If the count gets too low, you may receive a blood transfusion.

Low Platelet Count (Thrombocytopenia)

Platelets help your blood clot, so when the [count is low](#) you are at a higher risk of bleeding. Let your oncology care team know if you have any excess bruising or bleeding, including nose bleeds, bleeding gums or blood in your urine or stool. If the platelet count becomes too low, you may receive a transfusion of platelets.

- Do not use a razor (an electric razor is fine).
- Avoid contact sports and activities that can result in injury or bleeding.
- Do not take aspirin (salicylic acid), non-steroidal, anti-inflammatory medications (NSAIDs) such as Motrin/Advil (ibuprofen), Aleve (naproxen), Celebrex (celecoxib) etc. as these can all increase the risk of bleeding. Please consult with your healthcare team regarding use of these agents and all over the counter medications/supplements while on therapy.
- Do not floss or use toothpicks and use a soft-bristle toothbrush to brush your teeth.

Nausea and/or Vomiting

Talk to your oncology care team so they can prescribe medications to help you manage [nausea and vomiting](#). In addition, dietary changes may help. Avoid things that may worsen the symptoms, such as heavy or greasy/fatty, spicy or acidic foods (lemons, tomatoes, oranges). Try saltines, or ginger ale to lessen symptoms.

Call your oncology care team if you are unable to keep fluids down for more than 12 hours or if you feel lightheaded or dizzy at any time.

Diarrhea

Your oncology care team can recommend medications to relieve [diarrhea](#). Also, try eating [low-fiber](#), bland foods, such as white rice and boiled or baked chicken. Avoid raw fruits, vegetables, whole grain breads, cereals and seeds. Soluble fiber is found in some foods and absorbs fluid, which can help relieve diarrhea. Foods high in soluble fiber include: applesauce, bananas (ripe), canned fruit, orange sections, boiled potatoes, white rice, products made with white flour, oatmeal, cream of rice, cream of wheat, and farina. Drink 8-10 glasses of non-alcoholic, un-caffeinated fluid a day to prevent dehydration.

Loss or Thinning of Scalp and Body Hair (Alopecia)

Your hair may become [thin, brittle, or may fall out](#). This typically begins two to three weeks after treatment starts. This hair loss can be all body hair, including pubic, underarm, legs/arms, eyelashes, and nose hairs. The use of scarves, wigs, hats and hairpieces may help. Hair generally starts to regrow soon after treatment is completed. Remember your hair helps keep you warm in cold weather, so a hat is particularly important in cold weather or to protect you from the sun.

Nail and Skin Changes

Your fingernails/toenails may become dark, brittle or fall off. You may notice dry skin or changes in the color or tone of your skin. Your skin may be more sensitive to the sun, which can result in severe sunburn or rash. Sun sensitivity can last even after chemotherapy is completed. Avoid the sun between 10-2pm, when it is strongest. Wear sunscreen (at least SPF 15) everyday, wear sunglasses and long sleeves/pants to protect your skin. Keep

your fingernails and toenails clean and dry. You may use nail polish, but do not wear fake nails. If any nails fall off, clean the nail bed well with soap and water and cover with a band aid.

Less common, but important side effects can include:

- **Bladder Irritation:** Cyclophosphamide may irritate your bladder and can cause blood in your urine or pain with urination. Drink at least 6 to 8 glasses of fluid per day to flush out your bladder. You may be given IV fluids along with this medication to help lower the chance of bladder irritation. Let your care team know if you have a hard time urinating, have pain or pink/red urine, or bleed with urination. When given in high doses, your provider may give you a medication to protect your bladder.
- **Secondary Malignancies:** There is a very low risk of developing leukemia or another type of cancer due to treatment with this medication, which can happen many years after treatment. This is most often linked to repeated treatments or high doses.
- **Electrolyte Abnormalities:** This medication can affect the normal levels of electrolytes (sodium, potassium, magnesium, calcium, etc.) in your body. Your levels will be monitored using blood tests. If your levels become too low, your care team may prescribe specific electrolytes to be given by IV or taken by mouth. Do not take any supplements without first consulting with your care team.
- **Lung Changes:** This medication may cause lung changes, including pneumonitis (irritation of the lung tissue) and pulmonary fibrosis (a scarring and stiffening of the lung tissue). These problems can develop during treatment, or months to years after treatment is completed. Call your provider right away if you have new or worsening shortness of breath, cough, wheezing or difficulty breathing.
- **Heart Problems:** This medication can affect your heart function and can cause abnormal heartbeats or an abnormal heart rhythm called QT prolongation. Call your provider right away if you develop swelling of the feet or ankles, shortness of breath, have rapid weight gain, feel abnormal heartbeats, or if you feel dizzy or faint.
- **Wound Healing:** This medication can lead to slower or incomplete wound healing, such as a surgical wound not healing or staying closed. Be sure to inform the team performing the surgical procedure that you are taking this drug. You should also inform your oncology team that a surgical procedure is planned. It is recommended that this medication be discontinued prior to any surgery. In addition, any surgical incision should be fully healed prior to starting or restarting the medication. If you have a surgical wound that has not healed or begins to have signs of infection (redness, swelling, warmth), report this to your healthcare team.
- **Veno-occlusive Liver Disease:** This medication can cause blood clots in the small veins of your liver. This can lead to liver failure. If you feel like there is fluid in your belly or notice that your skin or the whites of your eyes are yellowing, contact your care team right away.

Reproductive Concerns

This medication may affect your reproductive system, resulting in the menstrual cycle or sperm production becoming irregular or stopping permanently. Women may experience menopausal effects including hot flashes and [vaginal dryness](#). In addition, the desire for sex may decrease during treatment. You may want to consider sperm banking or egg harvesting if you may wish to have a child in the future. Discuss these options with your oncology team.

Exposure of an unborn child to this medication could cause birth defects, so you should not become pregnant or father a child while on this medication. For women, effective birth control is necessary during treatment and for at least 1 year after treatment. For men, effective birth control is necessary during treatment and for at least 4 months after treatment. Even if your menstrual cycle stops or you believe you are not producing sperm, you could still be fertile and conceive. You should not breastfeed during treatment and for at least 1 week after your last dose.

Cytarabine (Cytosar-U®, Ara-C, DepoCyt®)

Pronounce: SITE-ah-rah-been

Classification: Antimetabolite

About Cytarabine (Cytosar-U®, Ara-C, DepoCyt®)

Cytarabine affects the DNA of cells. How it works is not clearly understood, but it seems to affect DNA polymerase (an important enzyme in DNA synthesis). Because cells cannot copy their DNA, they cannot properly divide, causing the cancer cells to die.

How to Take Cytarabine

Cytarabine is given through intravenous (into a vein) infusion or subcutaneous (SQ, under the skin) injection. This medication can also be given directly into the spinal column (intrathecal) to treat or prevent cancer or metastasis. The side effects experienced as a result of intrathecal treatment may be different. The dosage and schedule is determined by the person's size, type of cancer, and mode of administration. It can be given alone or with other drugs.

Possible Side Effects

There are a number of things you can do to manage the side effects of cytarabine. Talk to your care team about these recommendations. They can help you decide what will work best for you. These are some of the most common or important side effects:

Low White Blood Cell Count (Leukopenia or Neutropenia)

White blood cells (WBC) are important for fighting infection. While receiving treatment, your [WBC count can drop](#), putting you at a higher risk of getting an infection. You should let your doctor or nurse know right away if you have a fever (temperature greater than 100.4°F or 38°C), sore throat or cold, shortness of breath, cough, burning with urination, or a sore that doesn't heal.

Tips to preventing infection:

- [Washing hands](#), both yours and your visitors, is the best way to prevent the spread of infection.
- Avoid large crowds and people who are sick (i.e.: those who have a cold, fever or cough or live with someone with these symptoms).
- When working in your yard, wear protective clothing including long pants and gloves.
- Do not handle pet waste.
- Keep all cuts or scratches clean.
- Shower or bathe daily and perform frequent [mouth care](#).
- Do not cut cuticles or ingrown nails. You may wear nail polish, but not fake nails.
- Ask your oncology care team before scheduling dental appointments or procedures.
- Ask your oncology care team before you, or someone you live with, has any vaccinations.

Low Red Blood Cell Count (Anemia)

Your red blood cells are responsible for carrying oxygen to the tissues in your body. When the [red cell count is low](#), you may feel tired or weak. You should let your oncology care team know if you experience any shortness of breath, difficulty breathing or pain in your chest. If the count gets too low, you may receive a blood transfusion.

Low Platelet Count (Thrombocytopenia)

Platelets help your blood clot, so when the [count is low](#) you are at a higher risk of bleeding. Let your oncology care team know if you have any excess bruising or bleeding, including nose bleeds, bleeding gums or blood in your urine or stool. If the platelet count becomes too low, you may receive a transfusion of platelets.

- Do not use a razor (an electric razor is fine).
- Avoid contact sports and activities that can result in injury or bleeding.
- Do not take aspirin (salicylic acid), non-steroidal, anti-inflammatory medications (NSAIDs) such as Motrin/Advil (ibuprofen), Aleve (naproxen), Celebrex (celecoxib) etc. as these can all increase the risk of bleeding. Please consult with your healthcare team regarding use of these agents and all over the counter medications/supplements while on therapy.
- Do not floss or use toothpicks and use a soft-bristle toothbrush to brush your teeth.

Nausea and/or Vomiting

Talk to your oncology care team so they can prescribe medications to help you manage [nausea and vomiting](#). In addition, dietary changes may help. Avoid things that may worsen the symptoms, such as heavy or greasy/fatty, spicy or acidic foods (lemons, tomatoes, oranges). Try saltines, or ginger ale to lessen symptoms.

Call your oncology care team if you are unable to keep fluids down for more than 12 hours or if you feel lightheaded or dizzy at any time.

Mouth Ulcers (Mucositis)

Certain cancer treatments can cause [sores or soreness in your mouth](#) and/or throat. Notify your oncology care team if your mouth, tongue, inside of your cheek or throat becomes white, ulcerated or painful. Performing [regular mouth care](#) can help prevent or manage mouth sores. If mouth sores become painful, your doctor or nurse can recommend a pain reliever.

- Brush with a soft-bristle toothbrush or cotton swab twice a day.
- Avoid mouthwashes that contain alcohol. A baking soda and/or salt with warm water mouth rinse (2 level teaspoons of baking soda or 1 level teaspoon of salt in an eight ounce glass of warm water) is recommended 4 times daily.
- If your mouth becomes dry, eat moist foods, drink plenty of fluids (6-8 glasses), and suck on sugarless hard candy.
- Avoid smoking and chewing tobacco, drinking alcoholic beverages, and citrus juices.

Loss or Thinning of Scalp and Body Hair (Alopecia)

Your hair may become [thin, brittle, or may fall out](#). This typically begins two to three weeks after treatment starts. This hair loss can be all body hair, including pubic, underarm, legs/arms, eyelashes, and nose hairs. The use of scarves, wigs, hats, and hairpieces may help. Hair generally starts to regrow soon after treatment is completed. Remember your hair helps keep you warm in cold weather, so a hat is particularly important in cold weather or to protect you from the sun.

Decrease in Appetite or Taste Changes

[Nutrition](#) is an important part of your care. Cancer treatment can affect your appetite and, in some cases, the side effects of treatment can make eating difficult. Ask your oncology care team about nutritional counseling services at your treatment center to help with food choices.

- Try to eat five or six small meals or snacks throughout the day, instead of 3 larger meals.
- If you are not eating enough, nutritional supplements may help.
- You may experience a metallic taste or find that food has no taste at all. You may dislike foods or beverages that you liked before receiving cancer treatment. These symptoms can last for several

months or longer after treatment ends.

- Avoid any food that you think smells or tastes bad. If red meat is a problem, eat chicken, turkey, eggs, dairy products and fish without a strong smell. Sometimes cold food has less of an odor.
- Add extra flavor to meat or fish by marinating it in sweet juices, sweet and sour sauce or dressings. Use seasonings like basil, oregano or rosemary to add flavor. Bacon, ham and onion can add flavor to vegetables.

Diarrhea

Your oncology care team can recommend medications to relieve [diarrhea](#). Also, try eating [low-fiber](#), bland foods, such as white rice and boiled or baked chicken. Avoid raw fruits, vegetables, whole grain breads, cereals and seeds. Soluble fiber is found in some foods and absorbs fluid, which can help relieve diarrhea. Foods high in soluble fiber include: applesauce, bananas (ripe), canned fruit, orange sections, boiled potatoes, white rice, products made with white flour, oatmeal, cream of rice, cream of wheat, and farina. Drink 8-10 glasses of non-alcoholic, un-caffeinated fluid a day to prevent dehydration.

Hand Foot Syndrome

[Hand foot syndrome](#) (HFS) is a skin reaction that appears on the palms of the hands and/or the soles of the feet, as a result of certain chemotherapy agents being absorbed by the skin cells. HFS can begin as a mild tingling, numbness, pins-and-needles feeling, redness or pain or swelling of the hands and/or feet. This can then progress to painful swelling, blistering or peeling skin that can interfere with your ability to do normal activities. Be sure to let your oncology team know right away if you notice these symptoms, as they may need to adjust the chemotherapy dose or take a break to allow the skin to heal. Some tips to help prevent HFS include:

- Keep hands and feet clean and dry.
- Avoid tight shoes or socks.
- Avoid activities that put pressure on the palms or soles for 1 week after treatment.
- Apply an alcohol-free moisturizer liberally and often. (Avoid moisturizers with perfumes or scents)
- Avoid very hot water for baths and showers.

Liver Toxicity

This medication can cause liver toxicity, which your doctor may monitor for using blood tests called liver function tests. Notify your healthcare provider if you notice yellowing of the skin or eyes, your urine appears dark or brown or pain in your abdomen, as these can be signs of liver toxicity.

Tumor Lysis Syndrome

If there are a large amount of tumor cells in your body prior to treatment, you are at risk for tumor lysis syndrome. This happens when the tumor cells die too quickly and their waste overwhelms the body. You may be given a medication (allopurinol) and IV fluids to help prevent this. If you experience nausea, vomiting, diarrhea or become lethargic (drowsy, sluggish), notify your oncology team right away. TLS can affect your kidney function. Your provider will monitor your kidney function with blood work. Notify your provider if you have little or no urine output.

Fatigue

[Fatigue](#) is very common during cancer treatment and is an overwhelming feeling of exhaustion that is not usually relieved by rest. While on cancer treatment, and for a period after, you may need to adjust your schedule to manage fatigue. Plan times to rest during the day and conserve energy for more important activities. Exercise can help combat fatigue; a simple daily walk with a friend can help. Talk to your healthcare team for helpful tips on dealing with this side effect.

Live Vaccines

You, or anyone you live with, should avoid having live or live-attenuated vaccines while receiving this medication. These include herpes zoster (Zostavax) for shingles prevention, oral polio, measles, nasal flu vaccine (FluMist®), rotavirus and yellow fever vaccines.

Side Effects with High-Dose Regimens

High dose regimens are often used in the treatment of leukemia and this regimen is associated with specific side effects:

- **Neurologic Toxicity:** This can include changes in personality, sedation, difficulty with walking, balance, and coordination. Your nurse will perform neurologic checks prior to each dose to detect these side effects.
- **Eye Changes:** This most often causes a type of conjunctivitis. You may be given a steroid eye drop several times a day to prevent this side effect.

Reproductive Concerns

Exposure of an unborn child to this medication could cause birth defects, so you should not become pregnant or father a child while on this medication. Effective birth control is necessary during treatment and after treatment. Even if your menstrual cycle stops or you believe you are not producing sperm, you could still be fertile and conceive. You should consult with your healthcare team before breastfeeding while receiving this medication.

Dexamethasone (Decadron®)

Content Contributor: Marisa Healy, BSN, RN

Pronounce: deks a METH a sone

Classification: Glucocorticoid

About Dexamethasone (Decadron®)

Dexamethasone is a corticosteroid, similar to a hormone that is made naturally in your body. Corticosteroids (sometimes called "steroids") are used to decrease inflammation (swelling and/or redness) and are used in the management of a number of diseases, including asthma, autoimmune disorders, reactions to medications, and gastrointestinal disorders (colitis), among others. Dexamethasone may be given to prevent a reaction to a medication, prevent or decrease nausea, or be used in high doses to treat certain cancers.

How to Take Dexamethasone

Dexamethasone comes as a tablet or liquid to be taken by mouth. Dexamethasone can also be given intravenously (IV, into a vein) or injected into a muscle (IM).

Oral tablet form dexamethasone is best taken with food, as it can bother your stomach. Oral dexamethasone liquid should be mixed with other liquids like water, juices, or soda, or semi-solid food like applesauce or pudding. Your provider will probably tell you to take your dose(s) of dexamethasone at certain time(s) of the day every day. Your dose will depend on what the medication is being used for. Serious side effects can occur if you stop dexamethasone abruptly. Do not stop taking this medication or change your dose without direction from your healthcare team.

It is important to make sure you are taking the correct amount of medication every time. Before every dose, check that what you are taking matches what you have been prescribed.

Certain medications can interfere with oral and liquid dexamethasone, so make sure your provider is aware of all the medications, vitamins, and supplements you are taking.

You, or anyone you live with, should avoid having live or live-attenuated vaccines while receiving this medication on a long-term basis. These include herpes zoster (Zostavax) for shingles prevention, oral polio, measles, nasal flu vaccine (FluMist®), rotavirus, and yellow fever vaccines.

Dexamethasone is also available as an eye drop. This is often used to prevent eye conditions in patients with leukemia or lymphoma receiving chemotherapy. This type of dexamethasone does not cause the same side effects as the oral or liquid forms of this medication.

Storage and Handling

Store this medication at room temperature in the original container. If you prefer to use a pillbox, discuss this with your oncology pharmacist. Ask your oncology team where to return any unused medication for disposal. Do not flush down the toilet or throw in the trash. Keep containers out of reach of children and pets.

Where do I get this medication?

Dexamethasone is available through retail/mail-order pharmacy. Your oncology team will work with your prescription drug plan to identify an in-network retail/mail-order pharmacy for medication distribution.

Insurance Information

This medication may be covered under your prescription drug plan. Patient assistance may be available to qualifying individuals without prescription drug coverage. Co-pay cards, which reduce the patient co-pay responsibility for eligible commercially (non-government sponsored) insured patients, are also available. Your care team can help you find these resources if they are available.

Possible Side Effects of Dexamethasone

There are a number of things you can do to manage the side effects of dexamethasone. Talk to your care team about these recommendations. They can help you decide what will work best for you. These are some of the most common or important side effects:

Increase in Appetite

Dexamethasone can cause people to be more hungry or thirsty than usual. Drink plenty of fluids and try to make your snacks healthy ones, since there may be quite a few of them! This generally resolves once the medication has been stopped.

Increase in Energy

Dexamethasone can give people an increase in energy. They may also develop insomnia, or difficulty sleeping. Taking the medication in the morning may help to prevent this.

Irritability or Change in Mood

Some people report feeling irritable or noticing a change in their mood while taking this medication. If this becomes difficult to handle or if you have a desire to hurt yourself, notify a healthcare provider right away.

High Blood Sugar

This medication can cause elevated blood sugar levels in patients with and without diabetes. Your oncology care team will monitor your blood sugar. If you develop increased thirst, urination or hunger, blurry vision, headaches or your breath smells like fruit, notify your healthcare team. Diabetics should monitor their blood sugar closely and report elevations to the healthcare team.

Swelling

Patients may notice swelling in their hands and/or feet. Elevating the feet may help to lessen swelling in the feet and ankles. Avoid restrictive or tight clothing that may make it harder for the fluid to drain from the hands,

feet, and ankles.

Nausea and Heartburn

Taking dexamethasone with food or milk is generally enough to prevent nausea and heartburn. If possible, take the medication when you can be upright (not lying down) for a few hours after the dose. Avoid things that worsen the symptoms, and try antacids (milk of magnesia and calcium tablets, like Tums), saltines, or ginger ale to lessen symptoms.

Weakening of the Bones (Osteoporosis)

Long-term use of dexamethasone can lead to early osteoporosis. Your doctor may check your bone health. This is done with a bone density scan (dexa scan).

Other Side Effects

Dexamethasone can cause delayed wound healing, headaches, muscle weakness, and cataracts (after long-term use). Notify your care team if you are having any of these side effects.

If you are taking dexamethasone for an extended period of time, you may be more susceptible to developing an infection. If you have any new or worrisome symptoms such as fever, redness, fatigue, rapid heartbeat, or breathing, notify your provider right away.

Patients receiving dexamethasone eye drops may experience stinging or burning. Prolonged use of dexamethasone eye drops can increase your risk of glaucoma, visual changes, cataracts, and secondary eye infection. Report vision changes experienced while using dexamethasone eye drops to your healthcare team immediately.

Reproductive Concerns

Exposure of an unborn child to this medication could cause birth defects, so you should not become pregnant or father a child while on this medication. Effective birth control is necessary during treatment. Even if your menstrual cycle stops or you believe you are not producing sperm, you could still be fertile and conceive. You should consult with your healthcare team before breastfeeding while receiving this medication.

Doxorubicin (Adriamycin®, Rubex®)

Pronounce: DOX-oh-ROO-bi-sin

Classification: Anthracycline

About Doxorubicin (Adriamycin®, Rubex®)

Anthracyclines work by interrupting the copying of DNA, which is necessary for cancer cell growth. This causes the cancer cells to die, slowing or stopping tumor growth. Doxorubicin interferes with the growth of cancer cells and slows their spread in the body by inhibiting DNA synthesis and causing the production of harmful free radicals.

How to Take Doxorubicin

Doxorubicin is given through an intravenous (IV, into a vein) infusion or injection. It can be given alone or with other drugs. The dosage and schedule are determined by your height and weight, type of cancer, and how the medication is given.

Even when carefully and correctly administered by trained personnel, this drug may cause a feeling of burning and pain. There is a risk that this medication may leak out of the vein at the injection site, leading to tissue damage that can be severe. If the area of injection becomes red, swollen, or painful at any time during or after the injection, tell your care team right away. Do not apply anything to the site unless told to do so by your care

team.

This medication is red. Your urine may look orange or reddish in color for 1-2 days after the infusion. This is not blood. This is expected as the medication is cleared from your body. If the red urine lasts more than two days or if you have other urinary symptoms, such as frequency or painful urination, call your healthcare provider.

The blood levels and effectiveness of this medication can be affected by certain foods and medications, so they should be avoided. These include verapamil, phenytoin, fluconazole, voriconazole, St. John's wort, phenobarbital, trastuzumab, dexrazoxane, and 6-mercaptopurine, among others. Be sure to tell your healthcare provider about all medications and supplements you take.

Possible Side Effects of Doxorubicin

There are a number of things you can do to manage the side effects of doxorubicin. Talk to your care team about these recommendations. They can help you decide what will work best for you. These are some of the most common or important side effects:

Heart Problems

In rare cases, the heart muscle can be damaged by this medication, causing heart failure and cardiomyopathy. This heart damage can occur during therapy or many months to years after treatment. The risk is highest at higher doses, in patients who receive other cardio-toxic medications, radiation to the chest area, and in children. There is a maximum lifetime dose that you can receive of this medication. Your provider may order tests to check your heart function before you begin treatment or if any symptoms arise.

If you have shortness of breath, new or worsening cough, ankle swelling, chest pain, rapid or irregular heartbeats, call your provider right away, or call 911.

Secondary Cancers

A secondary cancer is one that develops as a result of cancer treatment for another cancer. This is quite rare, but you should be aware of the risk. In most cases, a secondary cancer related to chemotherapy is a blood cancer (leukemia, lymphoma). This can occur years after treatment. This is most often associated with repeated treatments or high doses. Your provider will monitor your labs closely. You may need a complete blood count with differential checked each year by your healthcare provider if you received high-risk therapies.

Low White Blood Cell Count (Leukopenia or Neutropenia)

White blood cells (WBC) are important for fighting infection. While receiving treatment, your [WBC count can drop](#), putting you at a higher risk of getting an infection. You should let your doctor or nurse know right away if you have a fever (temperature greater than 100.4°F or 38°C), sore throat or cold, shortness of breath, cough, burning with urination, or a sore that doesn't heal.

Tips to preventing infection:

- [Washing hands](#), both yours and your visitors, is the best way to prevent the spread of infection.
- Avoid large crowds and people who are sick (i.e.: those who have a cold, fever, or cough or live with someone with these symptoms).
- When working in your yard, wear protective clothing including long pants and gloves.
- Do not handle pet waste.
- Keep all cuts or scratches clean.
- Shower or bathe daily and perform frequent [mouth care](#).
- Do not cut cuticles or ingrown nails. You may wear nail polish, but not fake nails.
- Ask your oncology care team before scheduling dental appointments or procedures.
- Ask your oncology care team before you, or someone you live with has any vaccinations.

Low Red Blood Cell Count (Anemia)

Your red blood cells are responsible for carrying oxygen to the tissues in your body. When the [red cell count is low](#), you may feel tired or weak. You should let your oncology care team know if you experience any shortness of breath, difficulty breathing, or pain in your chest. If the count gets too low, you may receive a blood transfusion.

Low Platelet Count (Thrombocytopenia)

Platelets help your blood clot, so when the [count is low](#) you are at a higher risk of bleeding. Let your oncology care team know if you have any excess bruising or bleeding, including nose bleeds, bleeding gums, or blood in your urine or stool. If the platelet count becomes too low, you may receive a transfusion of platelets.

- Do not use a razor (an electric razor is fine).
- Avoid contact sports and activities that can result in injury or bleeding.
- Do not take aspirin (salicylic acid), non-steroidal, anti-inflammatory medications (NSAIDs) such as Motrin/Advil (ibuprofen), Aleve (naproxen), Celebrex (celecoxib), etc. as these can all increase the risk of bleeding. Please consult with your healthcare team regarding the use of these agents and all over-the-counter medications/supplements while on therapy.
- Do not floss or use toothpicks and use a soft-bristle toothbrush to brush your teeth.

Loss or Thinning of Scalp and Body Hair (Alopecia)

Your hair may become [thin, brittle, or may fall out](#). This typically begins two to three weeks after treatment starts. This hair loss can be all body hair, including pubic, underarm, legs/arms, eyelashes, and nose hairs. The use of scarves, wigs, hats, and hairpieces may help. Hair generally starts to regrow soon after treatment is completed. Remember your hair helps keep you warm in cold weather, so a hat is particularly important in cold weather or to protect you from the sun.

Nausea and/or Vomiting

Talk to your oncology care team so they can prescribe medications to help you manage [nausea and vomiting](#). In addition, dietary changes may help. Avoid things that may worsen the symptoms, such as heavy or greasy/fatty, spicy or acidic foods (lemons, tomatoes, oranges). Try saltines, or ginger ale to lessen symptoms.

Call your oncology care team if you are unable to keep fluids down for more than 12 hours or if you feel lightheaded or dizzy at any time.

Diarrhea

Your oncology care team can recommend medications to relieve [diarrhea](#). Also, try eating [low-fiber](#), bland foods, such as white rice and boiled or baked chicken. Avoid raw fruits, vegetables, whole-grain breads, cereals, and seeds. Soluble fiber is found in some foods and absorbs fluid, which can help relieve diarrhea. Foods high in soluble fiber include applesauce, bananas (ripe), canned fruit, orange sections, boiled potatoes, white rice, products made with white flour, oatmeal, cream of rice, cream of wheat, and farina. Drink 8-10 glasses of non-alcoholic, un-caffeinated fluid a day to prevent dehydration.

Mouth Ulcers (Mucositis)

Certain cancer treatments can cause [sores or soreness in your mouth](#) and/or throat. Notify your oncology care team if your mouth, tongue, inside of your cheek or throat becomes white, ulcerated or painful. Performing [regular mouth care](#) can help prevent or manage mouth sores. If mouth sores become painful, your doctor or nurse can recommend a pain reliever.

- Brush with a soft-bristle toothbrush or cotton swab twice a day.
- Avoid mouthwashes that contain alcohol. A baking soda and/or salt with warm water mouth rinse (2 level teaspoons of baking soda or 1 level teaspoon of salt in an eight-ounce glass of warm water) is

recommended 4 times daily.

- If your mouth becomes dry, eat moist foods, drink plenty of fluids (6-8 glasses), and suck on sugarless hard candy.
- Avoid smoking and chewing tobacco, drinking alcoholic beverages, and citrus juices.

Nail and Skin Changes

Your fingernails/toenails may become dark, brittle, or fall off. You may notice dry skin or changes in the color or tone of your skin. Your skin will be more sensitive to the sun, which can result in severe sunburn or rash. Sun sensitivity can last even after chemotherapy is completed. Avoid the sun between 10-2 pm, when it is strongest. Wear sunscreen (at least SPF 15) every day, wear sunglasses and long sleeves/pants to protect your skin. Keep your fingernails and toenails clean and dry. You may use nail polish, but do not wear fake nails. If any nails fall off, clean the nail bed well with soap and water and cover with a bandaid.

Less common, but important side effects can include:

- **Radiation Recall:** Radiation recall is when the administration of a medication causes a skin reaction that looks like a sunburn (redness, swelling, soreness, peeling skin) in areas where radiation was previously given. Notify your oncology team if you notice this side effect. Treatment can include topical steroid ointments and a delay in your next chemotherapy dose.
- **Tumor Lysis Syndrome:** If there are a large amount of tumor cells in your body prior to treatment, you are at risk for tumor lysis syndrome. This happens when the tumor cells die too quickly and their waste overwhelms the body. You may be given a medication (allopurinol) and IV fluids to help prevent this. If you experience nausea, vomiting, diarrhea or become lethargic (drowsy, sluggish), notify your oncology team right away. TLS can affect your kidney function. Your provider will monitor your kidney function with blood work. Notify your provider if you have little or no urine output.

Sexual & Reproductive Concerns

This drug may affect your reproductive system, resulting in the menstrual cycle or sperm production becoming irregular or stopping permanently. Women may experience menopausal effects including hot flashes and [vaginal dryness](#). In addition, the desire for sex may decrease during treatment.

Exposure of an unborn child to this medication could cause birth defects, so you should not become pregnant or father a child while on this medication. Women should use effective birth control during and for 6 months after treatment, even if your menstrual cycle stops. Men should use condoms during and for three months after treatment even if believe you are not producing sperm. If you have a pregnant partner, you should use condoms during and for 10 days after the last dose. You may want to consider sperm banking or egg harvesting if you may wish to have a child in the future. Discuss these options with your oncology team. You should not breastfeed while receiving this medication.

Methotrexate (Mexate®, Folex®, Rheumatrex®, Amethopterin, MTX)

Pronounce: meth-oh-TREKS-ate

Classification: Antimetabolite

About Methotrexate (Mexate®, Folex®, Rheumatrex®, Amethopterin, MTX)

Methotrexate interferes with DNA production. This stops cell growth and division, resulting in the slowing or stopping of cancer growth. Since cancer cells, in general, divide faster and with less error-correcting than healthy cells, cancer cells are more sensitive to this damage. Methotrexate competes with folic acid uptake in cells. This results in a folic acid deficiency in these cells and leads to cell death. By affecting the folic acid

uptake, methotrexate also alters DNA replication and cell division. Cancer cells take up methotrexate faster than normal cells (because they are rapidly dividing and thus replicate their DNA more frequently), causing their cell death.

Leucovorin is given starting 24 hours after methotrexate. Leucovorin is also known as folinic acid and is converted into a derivative of folic acid in the body. Therefore, Leucovorin is given in an attempt to prevent healthy cells from taking up too much methotrexate, but on the other hand, allowing time for the methotrexate to get into cancer cells to cause their death.

How to Take Methotrexate

Methotrexate is given by intravenous (IV) infusion. In special situations, it may be injected into the spinal cord space (called intrathecal administration). It can also be given by mouth in the form of a tablet. The dosage is based on your body weight, medical condition, and the regimen your physician is using.

***If you have been prescribed leucovorin in combination with methotrexate and are unable to take it, keep it down, or miss a dose, call your healthcare team immediately.**

The blood levels of this medication can be affected by certain foods and medications, so they should be avoided. These include non-steroidal anti-inflammatory (NSAID) medications including ibuprofen, tetracycline, penicillin, sulfamethoxazole/trimethoprim, some other oral antibiotics, and folic acid. Be sure to tell your healthcare provider about all medications and supplements you take.

You, or anyone you live with, should avoid having live or live-attenuated vaccines while receiving this medication. These include herpes zoster (Zostavax) for shingles prevention, oral polio, measles, nasal flu vaccine (FluMist®), rotavirus, and yellow fever vaccines.

Possible Side Effects of Methotrexate

There are a number of things you can do to manage the side effects of Methotrexate. Talk to your care team about these recommendations. They can help you decide what will work best for you. These are some of the most common or important side effects:

Infection and Low White Blood Cell Count (Leukopenia or Neutropenia)

This medication can cause life-threatening infections, with or without a decrease in white blood cell counts.

White blood cells (WBC) are important for fighting infection. While receiving treatment, your [WBC count can drop](#), putting you at a higher risk of getting an infection. You should let your doctor or nurse know right away if you have a fever (temperature greater than 100.4°F or 38°C), sore throat or cold, shortness of breath, cough, burning with urination, or a sore that doesn't heal.

Tips to preventing infection:

- [Washing hands](#), both yours and your visitors, is the best way to prevent the spread of infection.
- Avoid large crowds and people who are sick (i.e.: those who have a cold, fever, or cough or live with someone with these symptoms).
- When working in your yard, wear protective clothing including long pants and gloves.
- Do not handle pet waste.
- Keep all cuts or scratches clean.
- Shower or bathe daily and perform frequent [mouth care](#).
- Do not cut cuticles or ingrown nails. You may wear nail polish, but not fake nails.
- Ask your oncology care team before scheduling dental appointments or procedures.
- Ask your oncology care team before you, or someone you live with has any vaccinations.

Nausea and/or Vomiting

Talk to your oncology care team so they can prescribe medications to help you manage [nausea and vomiting](#). In addition, dietary changes may help. Avoid things that may worsen the symptoms, such as heavy or greasy/fatty, spicy or acidic foods (lemons, tomatoes, oranges). Try saltines, or ginger ale to lessen symptoms.

Call your oncology care team if you are unable to keep fluids down for more than 12 hours or if you feel lightheaded or dizzy at any time.

Mouth Sores (Mucositis)

Certain cancer treatments can cause [sores or soreness in your mouth](#) and/or throat. Notify your oncology care team if your mouth, tongue, inside of your cheek or throat becomes white, ulcerated, or painful. Performing [regular mouth care](#) can help prevent or manage mouth sores. If mouth sores become painful, your doctor or nurse can recommend a pain reliever.

- Brush with a soft-bristle toothbrush or cotton swab twice a day.
- Avoid mouthwashes that contain alcohol. A baking soda and/or salt with warm water mouth rinse (2 level teaspoons of baking soda or 1 level teaspoon of salt in an eight-ounce glass of warm water) is recommended 4 times daily.
- If your mouth becomes dry, eat moist foods, drink plenty of fluids (6-8 glasses), and suck on sugarless hard candy.
- Avoid smoking and chewing tobacco, drinking alcoholic beverages, and citrus juices.

Diarrhea

Your oncology team can recommend medications to relieve [diarrhea](#). Also, try eating [low-fiber](#), bland foods, such as white rice and boiled or baked chicken. Avoid raw fruits, vegetables, whole-grain breads, cereals, and seeds. Soluble fiber is found in some foods and absorbs fluid, which can help relieve diarrhea. Foods high in soluble fiber include applesauce, bananas (ripe), canned fruit, orange sections, boiled potatoes, white rice, products made with white flour, oatmeal, cream of rice, cream of wheat, and farina. Drink 8-10 glasses of non-alcoholic, uncaffeinated fluid a day to prevent dehydration.

Low Red Blood Cell Count (Anemia)

Your red blood cells are responsible for carrying oxygen to the tissues in your body. When the [red cell count is low](#), you may feel tired or weak. You should let your oncology care team know if you experience any shortness of breath, difficulty breathing, or pain in your chest. If the count gets too low, you may receive a blood transfusion.

Low Platelet Count (Thrombocytopenia)

Platelets help your blood clot, so when the [count is low](#) you are at a higher risk of bleeding. Let your oncology care team know if you have any excess bruising or bleeding, including nose bleeds, bleeding gums, or blood in your urine or stool. If the platelet count becomes too low, you may receive a transfusion of platelets.

- Do not use a razor (an electric razor is fine).
- Avoid contact sports and activities that can result in injury or bleeding.
- Do not take aspirin (salicylic acid), non-steroidal, anti-inflammatory medications (NSAIDs) such as Motrin/Advil (ibuprofen), Aleve (naproxen), Celebrex (celecoxib), etc. as these can all increase the risk of bleeding. Please consult with your healthcare team regarding the use of these agents and all over-the-counter medications/supplements while on therapy.
- Do not floss or use toothpicks and use a soft-bristle toothbrush to brush your teeth.

Fatigue

Fatigue is very common during cancer treatment and is an overwhelming feeling of exhaustion that is not usually relieved by rest. While on cancer treatment, and for a period after, you may need to adjust your schedule to manage fatigue. Plan times to rest during the day and conserve energy for more important activities. Exercise can help combat fatigue; a simple daily walk with a friend can help. Talk to your healthcare team for helpful tips on dealing with this side effect.

Loss or Thinning of Scalp and Body Hair (Alopecia)

Your hair may become **thin, brittle, or may fall out**. This typically begins two to three weeks after treatment starts. This hair loss can be all body hair, including pubic, underarm, legs/arms, eyelashes, and nose hairs. The use of scarves, wigs, hats, and hairpieces may help. Hair generally starts to regrow soon after treatment is completed. Remember your hair helps keep you warm in cold weather, so a hat is particularly important in cold weather or to protect you from the sun.

Nail and Skin Changes

Your fingernails/toenails may become dark, brittle, or fall off. Keep your fingernails and toenails clean and dry. You may use nail polish but do not wear fake nails (gels, acrylics, overlay). If any nails fall off, clean the nail bed well with soap and water and cover with a band-aid.

You may notice dry skin or changes in the color or tone of your skin. Your skin may be more sensitive to the sun, which can result in severe sunburn or rash. Sun sensitivity can last even after chemotherapy is completed. Avoid the sun between 10-2 p.m., when it is strongest. Wear sunscreen (at least SPF 30 with UVA/UVB protection) every day and reapply when in the sun for extended periods of time; wear sunglasses with UVA/UVB protection, a hat, and long sleeves/pants to protect your skin and seek out shade whenever possible.

Secondary Malignancies

There is a very low risk of developing leukemia, sarcoma, lung cancer, or other types of cancer due to treatment with this medication, which can occur many years after treatment. This is most often associated with repeated treatments or high doses.

Kidney Problems

This medication can cause kidney problems, including an increased creatinine level, which your oncology care team may monitor for using blood tests. Notify your healthcare provider if you notice decreased urine output, blood in the urine, swelling in the ankles, or loss of appetite.

Tumor Lysis Syndrome

If there are a large number of tumor cells in your body prior to treatment, you are at risk for tumor lysis syndrome. This happens when the tumor cells die too quickly and their waste overwhelms the body. You may be given a medication (allopurinol) and IV fluids to help prevent this. If you experience nausea, vomiting, diarrhea, or become lethargic (drowsy, sluggish), notify your oncology team right away. TLS can affect your kidney function. Your provider will monitor your kidney function with blood work. Notify your provider if you have little or no urine output.

Radiation Recall

Radiation recall is when the administration of a medication causes a skin reaction that looks like a sunburn (redness, swelling, soreness, peeling skin) in areas where radiation was previously given. Notify your oncology team if you notice this side effect. Treatment can include topical steroid ointments and a delay in your next chemotherapy dose.

Less common, but important side effects can include:

- **Lung Changes:** This medication can cause an opportunistic infection called pneumocystis pneumonia. It can also cause interstitial pneumonitis, particularly when high doses have been received. Interstitial pneumonitis can develop months to years after treatment is completed and may be more common in

people with pre-existing lung conditions. Notify your healthcare provider if you develop fever, shortness of breath, non-productive cough, wheezing, or difficulty breathing.

- **Liver Toxicity:** This medication can cause liver toxicity, which your oncology care team may monitor using blood tests called liver function tests. Notify your healthcare provider if you notice yellowing of the skin or eyes, your urine appears dark or brown, or you have pain in your abdomen, as these can be signs of liver toxicity.
- **Eye Problems:** This medication can cause your eyes to become irritated or watery and you may be more sensitive to light. Notify your provider if you develop any eye changes.
- **Neurologic changes:** This medication can affect the nervous system, causing you to feel drowsy, dizzy, or confused. Notify your provider if you are feeling different.

Sexual & Reproductive Concerns

This medication may affect your reproductive system, resulting in the menstrual cycle or sperm production becoming irregular or stopping permanently. Women may experience menopausal effects including hot flashes and [vaginal dryness](#). In addition, the desire for sex may decrease during treatment. You may want to consider sperm banking or egg harvesting if you wish to have a child in the future. Discuss these options with your oncology team.

Exposure of an unborn child to this medication could cause birth defects, so you should not become pregnant or father a child while on this medication. Effective birth control is necessary during treatment and for at least 3 months after treatment for men and during treatment and for at least 6 months for women, even if your menstrual cycle stops or you believe you are not producing sperm. You should not breastfeed while receiving this medication.

Intrathecal (Spinal) Administration

When injected into the spinal cord space, methotrexate can cause headache, vomiting, fever, or stiff neck. In rare cases, intrathecal administration can cause neurotoxicity, which presents with paralysis, speech difficulty, seizures, or coma. This can occur up to several days after the treatment and resolves in a few days.

Methotrexate Oral Formulation (Trexall®, Rheumatrex®, MTX)

Pronounce: meth-oh-TREK-sate

Classification: Antimetabolite

About Methotrexate Oral Formulation (Trexall®, Rheumatrex®, MTX)

Methotrexate interferes with DNA production. This stops cell growth and division, resulting in the slowing or stopping of cancer growth. Since cancer cells, in general, divide faster and with less error-correcting than healthy cells, cancer cells are more sensitive to this damage. Methotrexate competes with folic acid uptake in cells. This results in a folic acid deficiency in these cells and leads to cell death. By affecting the folic acid uptake, methotrexate also alters DNA replication and cell division. Cancer cells take up methotrexate faster than normal cells (because they are rapidly dividing and thus replicate their DNA more frequently), causing their cell death.

Depending on your diagnosis, you may also receive leucovorin starting 24 hours after methotrexate. Leucovorin is also known as folinic acid and is converted into a derivative of folic acid in the body. Therefore, leucovorin is given in an attempt to prevent healthy cells from taking up too much methotrexate, while allowing time for the methotrexate to get into cancer cells to cause their death.

How to Take Oral Methotrexate

Methotrexate comes in a tablet taken by mouth. Your dosing schedule will depend on the disease being treated as well as how your body responds to the medication. It is important to follow your healthcare team's dosage instructions carefully. You should not take larger or smaller amounts than prescribed by your healthcare provider.

It is important to make sure you are taking the correct amount of medication every time. Before every dose, check that what you are taking matches what you have been prescribed.

The blood levels of this medication can be affected by certain foods and medications, so they should be avoided. These include: non-steroidal anti-inflammatory (NSAID) medications including ibuprofen, tetracycline, penicillin, sulfamethoxazole/trimethoprim, and other oral antibiotics and folic acid. Be sure to tell your healthcare provider about all medications and supplements you take.

****If you have been prescribed leucovorin in combination with methotrexate and are unable to take it, keep it down or miss a dose, call your healthcare team immediately.***

You, or anyone you live with, should avoid having live or live-attenuated vaccines while receiving this medication. These include herpes zoster (Zostavax) for shingles prevention, oral polio, measles, nasal flu vaccine (FluMist®), rotavirus, and yellow fever vaccines.

Storage and Handling

Store your medication in the original, labeled container at room temperature and in a dry location (unless otherwise directed by your healthcare provider or pharmacist). This medication should not be stored in a pillbox. Keep containers out of reach of children and pets.

If a caregiver prepares your dose for you, they should consider wearing gloves or pour the pills directly from their container into the cap, a small cup, or directly into your hand. They should avoid touching the pills. They should always wash their hands before and after giving you the medication. Pregnant or nursing women should not prepare the dose for you. Ask your oncology team where to return any unused medication for disposal. Do not flush it down the toilet or throw it in the trash.

Where do I get this medication?

Depending on your prescription insurance coverage, oral methotrexate may be available at a retail pharmacy or through a specialty pharmacy. Your oncology team will work with your prescription drug plan to identify an in-network pharmacy for the distribution of this medication.

Insurance Information

This medication may be covered under your prescription drug plan. Patient assistance may be available to qualifying individuals without prescription drug coverage. Co-pay cards, which reduce the patient's co-pay responsibility for eligible commercially (non-government sponsored) insured patients, are also offered by the manufacturer. Co-pay assistance from private third party foundations may be available. Your care team can help you access these resources if they are available.

This medication is covered under Medicare part B for Medicare recipients. Make sure your pharmacist knows to process this prescription through your Medicare part B and NOT part D.

Possible Side Effects of Methotrexate

There are a number of things you can do to manage the side effects of Methotrexate. Talk to your care team about these recommendations. They can help you decide what will work best for you. These are some of the most common or important side effects:

Allergic Reactions

In some cases, patients can have an allergic reaction to this medication. Signs of a reaction can include: shortness of breath or difficulty breathing, chest pain, rash, flushing or itching, or a decrease in blood pressure. If you notice any changes in how you feel, let your provider know immediately. This medication can also severely affect your bone marrow, gastrointestinal tract, liver, lungs, skin, and kidneys. It is important to notify your provider of any new symptoms or side effects you are having.

Nausea and/or Vomiting

Talk to your care team so they can prescribe medications to help you manage [nausea and vomiting](#). In addition, dietary changes may help. Avoid things that may worsen the symptoms, such as heavy or greasy/fatty, spicy or acidic foods (lemons, tomatoes, oranges). Try antacids, (e.g. milk of magnesia, calcium tablets such as Tums), saltines, or ginger ale to lessen symptoms.

Call your doctor or nurse if you are unable to keep fluids down for more than 12 hours or if you feel lightheaded or dizzy at any time.

Diarrhea

Your oncology team can recommend medications to relieve [diarrhea](#). Also, try eating [low-fiber](#), bland foods, such as white rice and boiled or baked chicken. Avoid raw fruits, vegetables, whole grain breads, cereals, and seeds. Soluble fiber is found in some foods and absorbs fluid, which can help relieve diarrhea. Foods high in soluble fiber include: applesauce, bananas (ripe), canned fruit, orange sections, boiled potatoes, white rice, products made with white flour, oatmeal, cream of rice, cream of wheat, and farina. Drink 8-10 glasses of non-alcoholic, un-caffeinated fluid a day to prevent dehydration.

Low White Blood Cell Count (Leukopenia or Neutropenia)

White blood cells (WBC) are important for fighting infection. While receiving treatment, your [WBC count can drop](#), putting you at a higher risk of getting an infection. You should let your doctor or nurse know right away if you have a fever (temperature greater than 100.4°F or 38°C), sore throat or cold, shortness of breath, cough, burning with urination, or a sore that doesn't heal.

Tips to preventing infection:

- [Washing hands](#), both yours and your visitors, is the best way to prevent the spread of infection.
- Avoid large crowds and people who are sick (i.e.: those who have a cold, fever or cough or live with someone with these symptoms).
- When working in your yard, wear protective clothing including long pants and gloves.
- Do not handle pet waste.
- Keep all cuts or scratches clean.
- Shower or bath daily and perform frequent [mouth care](#).
- Do not cut cuticles or ingrown nails. You may wear nail polish, but not fake nails.
- Ask your oncology care team before scheduling dental appointments or procedures.
- Ask your oncology care team before you, or someone you live with has any vaccinations.

Low Red Blood Cell Count (Anemia)

Your red blood cells are responsible for carrying oxygen to the tissues in your body. When the [red cell count is low](#), you may feel tired or weak. You should let your oncology care team know if you experience any shortness of breath, difficulty breathing, or pain in your chest. If the count gets too low, you may receive a blood transfusion.

Low Platelet Count (Thrombocytopenia)

Platelets help your blood clot, so when the [count is low](#) you are at a higher risk of bleeding. Let your oncology care team know if you have any excess bruising or bleeding, including nose bleeds, bleeding gums, or blood in your urine or stool. If the platelet count becomes too low, you may receive a transfusion of platelets.

- Do not use a razor (an electric razor is fine).
- Avoid contact sports and activities that can result in injury or bleeding.
- Do not take aspirin (salicylic acid), non-steroidal, anti-inflammatory medications (NSAIDs) such as Motrin/Advil (ibuprofen), Aleve (naproxen), Celebrex (celecoxib) etc. as these can all increase the risk of bleeding. Please consult with your healthcare team regarding use of these agents and all over the counter medications/supplements while on therapy.
- Do not floss or use toothpicks and use a soft-bristle toothbrush to brush your teeth.

Mouth Sores (Mucositis)

Certain cancer treatments can cause [sores or soreness in your mouth](#) and/or throat. Notify your oncology care team if your mouth, tongue, inside of your cheek or throat becomes white, ulcerated or painful. Performing [regular mouth care](#) can help prevent or manage mouth sores. If mouth sores become painful, your doctor or nurse can recommend a pain reliever.

- Brush with a soft-bristle toothbrush or cotton swab twice a day.
- Avoid mouthwashes that contain alcohol. A baking soda and/or salt with warm water mouth rinse (2 level teaspoons of baking soda or 1 level teaspoon of salt in an eight ounce glass of warm water) is recommended 4 times daily.
- If your mouth becomes dry, eat moist foods, drink plenty of fluids (6-8 glasses), and suck on sugarless hard candy.
- Avoid smoking and chewing tobacco, drinking alcoholic beverages, and citrus juices.

Loss or Thinning of Scalp and Body Hair (Alopecia)

Your hair may become [thin, brittle, or may fall out](#). This typically begins two to three weeks after treatment starts. This hair loss can be all body hair, including pubic, underarm, legs/arms, eyelashes, and nose hairs. The use of scarves, wigs, hats, and hairpieces may help. Hair generally starts to regrow soon after treatment is completed. Remember your hair helps keep you warm in cold weather, so a hat is particularly important in cold weather or to protect you from the sun.

Nail and Skin Changes

Your fingernails/toenails may become dark, brittle, or fall off. Keep your fingernails and toenails clean and dry. You may use nail polish, but do not wear fake nails (gels, acrylics, overlay). If any nails fall off, clean the nail bed well with soap and water and cover with a band aid.

You may notice dry skin or changes in the color or tone of your skin. Your skin may be more sensitive to the sun, which can result in severe sunburn or rash. Sun sensitivity can last even after chemotherapy is completed. Avoid the sun between 10-2pm, when it is strongest. Wear sunscreen (at least SPF 30 with UVA/UVB protection) every day and reapply when in the sun for extended periods of time; wear sunglasses with UVA/UVB protection, a hat, and long sleeves/pants to protect your skin and seek out shade whenever possible.

Secondary Malignancies

There is a very low risk of developing leukemia, sarcoma, lung cancer, or other types of cancer due to treatment with this medication, which can occur many years after treatment. This is most often associated with repeated treatments or high doses.

Kidney Problems

This medication can cause kidney problems, including an increased creatinine level, which your oncology care

team may monitor for using blood tests. Notify your healthcare provider if you notice decreased urine output, blood in the urine, swelling in the ankles, or loss of appetite.

Tumor Lysis Syndrome

If there are a large amount of tumor cells in your body prior to treatment, you are at risk for tumor lysis syndrome. This happens when the tumor cells die too quickly and their waste overwhelms the body. You may be given a medication (allopurinol) and IV fluids to help prevent this. If you experience nausea, vomiting, diarrhea, or become lethargic (drowsy, sluggish), notify your oncology team right away. TLS can affect your kidney function. Your provider will monitor your kidney function with blood work. Notify your provider if you have little or no urine output.

Radiation Recall

Radiation recall is when the administration of a medication causes a skin reaction that looks like a sunburn (redness, swelling, soreness, peeling skin) in areas where radiation was previously given. Notify your oncology team if you notice this side effect. Treatment can include topical steroid ointments and a delay in your next chemotherapy dose.

Less common, but important side effects can include:

- **Lung Changes:** This medication can cause an opportunistic infection called pneumocystis pneumonia. This medication can also cause interstitial pneumonitis, particularly when high doses have been received. Interstitial pneumonitis can develop months to years after treatment is completed and may be more common in people with pre-existing lung conditions. Call your oncology care team right away if you have shortness of breath, cough, wheezing or difficulty breathing.
- **Liver Toxicity:** This medication can cause liver toxicity, which your oncology care team may monitor for using blood tests called liver function tests. Notify your healthcare provider if you notice yellowing of the skin or eyes, your urine appears dark or brown, or you have pain in your abdomen, as these can be signs of liver toxicity,
- **Eye Problems:** This medication can cause your eyes to become irritated or watery and you may be more sensitive to light. Notify your provider if you develop any eye changes.
- **Neurologic changes:** This medication can affect the nervous system, causing you to feel drowsy, dizzy, or confused. Notify your provider if you are feeling different.

Sexual & Reproductive Concerns

This medication may affect your reproductive system, resulting in the menstrual cycle or sperm production becoming irregular or stopping permanently. Women may experience menopausal effects including hot flashes and [vaginal dryness](#). In addition, the desire for sex may decrease during treatment. You may want to consider sperm banking or egg harvesting if you may wish to have a child in the future. Discuss these options with your oncology team.

Exposure of an unborn child to this medication could cause birth defects, so you should not become pregnant or father a child while on this medication. Effective birth control is necessary during treatment and for at least 6 months after treatment for women and 3 months after treatment for men. Even if your menstrual cycle stops or you believe you are not producing sperm. You should not breastfeed while receiving this medication or for one week after your last dose.

Vincristine (Oncovin®, Vincasar PFS®, VCR)

Pronounce: vin-KRIS-teen

Classification: Antimicrotubule Agent

About Vincristine (Oncovin®, Vincasar PFS®, VCR)

Vincristine is a member of the vinca alkaloids family of chemotherapy agents. These medications work by interfering with cell division, which leaves the tumor unable to grow and spread. Vincristine was developed from the periwinkle plant.

How to Take Vincristine

This medication is administered intravenously (IV, into a vein) by a trained professional. Your dose and treatment schedule depend on your size and the type of cancer being treated.

This medication is a vesicant. Even when carefully and correctly administered by trained personnel, this drug may cause a feeling of burning and pain. There is a risk that this medication may leak out of the vein at the injection site, resulting in tissue damage that can be severe. If the area of injection becomes red, swollen, or painful at any time during or after the injection, notify your doctor or nurse immediately. Do not apply anything to the site unless instructed by your doctor or nurse.

The blood levels of this medication can be affected by certain foods and medications, so they should be avoided. These include grapefruit, grapefruit juice, ketoconazole, rifampin, phenytoin, St. John's wort, and many anti-fungal medications. Be sure to tell your healthcare provider about all medications and supplements you take.

Possible Side Effects of Vincristine

There are a number of things you can do to manage the side effects of vincristine. Talk to your care team about these recommendations. They can help you decide what will work best for you. These are some of the most common or important side effects:

Constipation

Vincristine can cause serious constipation, abdominal pain and can even lead to a blockage or stoppage of the bowel (called paralytic ileus) if not treated promptly. There are several things you can do to prevent or relieve constipation. Include fiber in your diet (fruits and vegetables), drink 8-10 glasses of non-alcoholic fluids a day, and keep active. A stool softener once or twice a day may prevent constipation. If you do not have a bowel movement for 2-3 days, you should contact your healthcare team for [suggestions to relieve the constipation](#).

Neurotoxicity

This is a toxicity that affects the nerves. The most common effect is called peripheral neuropathy, which affects the nerves in the hands and feet, causing numbness or tingling, often in the pattern of a stocking or glove. This can get worse with additional doses of the medication and can lead to difficulty with balance or walking. In some people, the symptoms slowly get better after the medication is stopped, but for some, it never goes away completely. Let your healthcare provider know if you have numbness or tingling in the hands and feet, as they may need to adjust the doses of your medication.

The vinca alkaloid class of chemotherapies is known to cause neuropathy, but vincristine can also cause neurologic toxicity that presents as mental depression, headache, malaise, dizziness, and seizures. It can also cause toxicity of the cranial nerves, which affects the vocal cords (changes in voice), eyes (visual changes), or facial nerves (drooping of the face or mouth). Patients can develop severe pain in the jaw soon after the first treatment with vincristine, which is caused by the medication affecting the nerves. If you notice any of these problems, notify your healthcare team right away.

Low White Blood Cell Count (Leukopenia or Neutropenia)

White blood cells (WBC) are important for fighting infection. While receiving treatment, your [WBC count can drop](#), putting you at a higher risk of getting an infection. You should let your provider know right away if you have a fever (temperature greater than 100.4°F or 38°C), sore throat or cold, shortness of breath, cough, burning with urination, or a sore that doesn't heal.

Tips to preventing infection:

- [Washing hands](#), both yours and your visitors, is the best way to prevent the spread of infection.
- Avoid large crowds and people who are sick (i.e.: those who have a cold, fever, or cough or live with someone with these symptoms).
- When working in your yard, wear protective clothing including long pants and gloves.
- Do not handle pet waste.
- Keep all cuts or scratches clean.
- Shower or bathe daily and perform frequent [mouth care](#).
- Do not cut cuticles or ingrown nails. You may wear nail polish, but not fake nails.
- Ask your oncology care team before scheduling dental appointments or procedures.
- Ask your oncology care team before you, or someone you live with has any vaccinations.

Low Red Blood Cell Count (Anemia)

Your red blood cells are responsible for carrying oxygen to the tissues in your body. When the [red cell count is low](#), you may feel tired or weak. You should let your oncology care team know if you experience any shortness of breath, difficulty breathing, or pain in your chest. If the count gets too low, you may receive a blood transfusion.

Low Platelet Count (Thrombocytopenia)

Platelets help your blood clot, so when the [count is low](#) you are at a higher risk of bleeding. Let your oncology care team know if you have any excess bruising or bleeding, including nose bleeds, bleeding gums, or blood in your urine or stool. If the platelet count becomes too low, you may receive a transfusion of platelets.

- Do not use a razor (an electric razor is fine).
- Avoid contact sports and activities that can result in injury or bleeding.
- Do not take aspirin (salicylic acid), non-steroidal, anti-inflammatory medications (NSAIDs) such as Motrin/Advil (ibuprofen), Aleve (naproxen), Celebrex (celecoxib), etc. as these can all increase the risk of bleeding. Please consult with your healthcare team regarding the use of these agents and all over-the-counter medications/supplements while on therapy.
- Do not floss or use toothpicks and use a soft-bristle toothbrush to brush your teeth.

Mouth Ulcers (Sores)

Certain cancer treatments can cause [sores or soreness in your mouth](#) and/or throat. Notify your oncology care team if your mouth, tongue, inside of your cheek or throat becomes white, ulcerated, or painful. Performing [regular mouth care](#) can help prevent or manage mouth sores. If mouth sores become painful, your doctor or nurse can recommend a pain reliever.

- Brush with a soft-bristle toothbrush or cotton swab twice a day.
- Avoid mouthwashes that contain alcohol. A baking soda and/or salt with warm water mouth rinse (2 level teaspoons of baking soda or 1 level teaspoon of salt in an eight-ounce glass of warm water) is recommended 4 times daily.
- If your mouth becomes dry, eat moist foods, drink plenty of fluids (6-8 glasses), and suck on sugarless hard candy.
- Avoid smoking and chewing tobacco, drinking alcoholic beverages, and citrus juices.

Loss or Thinning of Scalp and Body Hair (Alopecia)

Your hair may become [thin, brittle, or may fall out](#). This typically begins two to three weeks after treatment

starts. This hair loss can be all body hair, including pubic, underarm, legs/arms, eyelashes, and nose hairs. The use of scarves, wigs, hats, and hairpieces may help. Hair generally starts to regrow soon after treatment is completed. Remember your hair helps keep you warm in cold weather, so a hat is particularly important in cold weather or to protect you from the sun.

Fatigue

Fatigue is very common during cancer treatment and is an overwhelming feeling of exhaustion that is not usually relieved by rest. While on cancer treatment, and for a period after, you may need to adjust your schedule to manage fatigue. Plan times to rest during the day and conserve energy for more important activities. Exercise can help combat fatigue; a simple daily walk with a friend can help. Talk to your healthcare team for helpful tips on dealing with this side effect.

Nausea and/or Vomiting

Talk to your care team so they can prescribe medications to help you manage **nausea and vomiting**. In addition, dietary changes may help. Avoid things that may worsen the symptoms, such as heavy or greasy/fatty, spicy or acidic foods (lemons, tomatoes, oranges). Try antacids, (e.g. milk of magnesia, calcium tablets such as Tums), saltines, or ginger ale to lessen symptoms.

Call your doctor or nurse if you are unable to keep fluids down for more than 12 hours or if you feel lightheaded or dizzy at any time.

Less common, but important side effects can include:

- **Urinary retention:** This is the inability to urinate even when you feel that you need to. If you notice you are unable to urinate, you should call your healthcare team right away or go to the emergency room to be evaluated.
- **Allergic reaction:** Some patients will have an allergic reaction to the medication during the infusion or shortly after. Let your nurse know right away if you have any shortness of breath or difficulty breathing, rash, or swelling of the face.
- **Radiation Recall:** This medication may cause radiation recall. It may present as a skin reaction that looks like a sunburn (redness, swelling, soreness, peeling skin) in areas where radiation was previously given. Notify your oncology care team if you notice this side effect. Treatment can include topical steroid ointments and a delay in your next chemotherapy dose.

Sexual & Reproductive Concerns

This drug may affect your reproductive system, resulting in the menstrual cycle or sperm production becoming irregular or stopping permanently. Women may experience menopausal effects including hot flashes and **vaginal dryness**. In addition, the desire for sex may decrease during treatment.

Exposure of an unborn child to this medication could cause birth defects, so you should not become pregnant or father a child while on this medication. Effective birth control is necessary during treatment, even if your menstrual cycle stops or you believe you are not producing sperm. You may want to consider sperm banking or egg harvesting if you may wish to have a child in the future. Discuss these options with your oncology team. You should consult with your healthcare team before breastfeeding while receiving this medication.

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