



Fluorouracil (Acrucil®, 5-FU)

Pronounce: flure-oh-YOOR-a-sil

Classification: Antimetabolite

About Fluorouracil (Acrucil®, 5-FU)

An antimetabolite medication affects how DNA is made in cells. Cancer cells divide faster and with less error correction than healthy cells, making them more sensitive to these effects.

Fluorouracil changes how cancer cells make and use DNA and RNA. Fluorouracil prevents cancer cells from making important proteins, which causes cell death and can slow or stop cancer from growing.

How to Take Fluorouracil

Fluorouracil is given as an intravenous (IV, into a vein) infusion. How long the infusion takes depends on your treatment regimen. The dose will be determined by your care team. It can be given alone or with other medications.

If you take warfarin, your INR and PT levels will be closely monitored to adjust your warfarin dose as needed. Please make sure your healthcare team is aware of all the medicines you take before you begin treatment.

Possible Side Effects of Fluorouracil

There are a number of things you can do to manage the side effects of fluorouracil. 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 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.

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, uncaffeinated 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.

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.

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.

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.

Important but Less Common Side Effects

- **Heart Problems:** In some cases, this medication can cause or worsen pre-existing heart problems including congestive heart failure, decreased heart function, and heart attack. Notify your healthcare provider if you have sudden weight gain or swelling in the ankles or legs. If you develop chest pain or pressure, pain in the left arm, back, or jaw, sweating, shortness of breath, clammy skin, nausea, dizziness, or lightheadedness, call 911 or go to the nearest emergency room.
- **Neurotoxicity:** This medication can cause neurological issues such as confusion, disorientation, ataxia (trouble walking), and visual disturbances. Call your provider immediately if you are having any symptoms of a neurological issue.
- **Elevated Ammonia Level:** This medication can cause the level of ammonia in your blood to become too high, which can then affect how your brain is functioning. You will have your labs checked to monitor your ammonia level. Symptoms include ataxia (trouble walking), intellectual impairment, and changes in behavior. Call your provider immediately if you notice any of these symptoms.
- **DPD Gene Mutation:** There is a very rare genetic mutation in the DPD gene that can cause very serious side effects to this medication. Report any worsening or unusual symptoms to your healthcare

team immediately.

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 3 months after treatment, even if your menstrual cycle stops or you believe you are not producing sperm. You should not breastfeed while receiving this medication.

Leucovorin (Calcium Leucovorin, Citrovorum Factor, Folinic Acid)

Content Contributor: Christina Bach, MBE, LCSW, OSW-C, FAOSW

Pronounce: loo-koe-VOR-in

Classification: Folic Acid Analog

About Leucovorin (Calcium Leucovorin, Citrovorum Factor, Folinic Acid)

Leucovorin is not a chemotherapy medication. It is given with chemotherapy. Leucovorin can be used with the chemotherapy medication [fluorouracil \(5-FU\)](#). In this case, it is used to enhance the effects of the fluorouracil, in other words, to make the drug work better. Leucovorin is also given with a chemotherapy agent called [methotrexate](#), but in this case, it is given to "rescue" normal, healthy cells from the damage caused by the methotrexate. In order to give the methotrexate time to kill the cancer cells, leucovorin is started 12-24 hours after the methotrexate is given.

How to Take Leucovorin

This medication can be given in an intravenous (IV) or oral form (by mouth). The dosage is based on the particular protocol being used by the doctor. You should not take supplemental folic acid while receiving leucovorin, as this may enhance the effect to an undesirable degree.

If you are taking the oral form of leucovorin, 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.

Storage and Handling

Store the oral form of 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.

Where do I get this medication?

The oral formulation of this medication is available through a retail or mail-order pharmacy. Your oncology team will work with your prescription drug plan to identify an in-network pharmacy for medication distribution.

Insurance Information

This medication may be covered under your prescription drug plan. Co-pay assistance from private third-party foundations may be available. Your care team can help you access these resources if they are available.

Possible Side Effects of Leucovorin

Leucovorin rarely has side effects. Any side effects experienced are generally associated with the chemotherapy that is given with the leucovorin, rather than the leucovorin itself. In the case of [fluorouracil](#), leucovorin may make the side effects of that medication worse. When used with [methotrexate](#), it helps to lessen the severity of side effects. In rare cases, rash, hives, itching, and wheezing have been reported with leucovorin.

Oxaliplatin (Eloxatin®)

Pronounce: ox-AL-i-PLA-tin

Classification: Platinum Chemotherapy

About Oxaliplatin (Eloxatin®)

Oxaliplatin is a type of platinum chemotherapy, which are made up of heavy metal compounds that inhibit synthesis of RNA, DNA, and protein in cells. All of these are vital for cells to divide and grow. By preventing them from dividing, the medication can stop the cancer from growing.

How to Take Oxaliplatin

Oxaliplatin is given by intravenous (IV, into a vein) infusion. It is often given in combination with other chemotherapy medications such as fluorouracil and irinotecan. The dosage and schedule is determined by the person's size, type of cancer, and mode of administration.

This medication can cause dizziness, vision problems, or vision loss. You should not drive or operate machinery until you know how the medication affects you.

Possible Side Effects of Oxaliplatin

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

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 during the infusion, let your nurse know immediately. The infusion will be slowed or stopped if this occurs. Depending on the severity of your reaction, you may still be able to receive the medication with a pre-medication to prevent a reaction, or if the medication is given at a slower rate.

Peripheral Neuropathy (Numbness or Tingling in the Hands and/or Feet)

This medication can cause two types of neuropathy, which are caused by damage to nerves. The first type tends to occur within 1-2 days of receiving the medication, tends to resolve within 2 weeks, and can reoccur with subsequent doses. It can feel like a tingling or numbness (pins & needles) or burning in the hands, feet, area around the mouth, or in the throat. This neuropathy can be exacerbated by exposure to cold temperature or cold objects (drinking a cold drink can trigger a feeling of spasm in the throat, or touching a cold steering wheel could cause numbness or tingling of the hands). Avoid cold exposure for several days after treatment. Drink room temperature fluids and wear gloves and socks in cool weather.

The second type of neuropathy tends to develop after several doses, persists between treatments (no break in the symptoms), and can get progressively worse with additional doses of the medication. It is typically a numbness and tingling in the hands and/or feet in the area a glove or sock would cover. This can progress to be painful and can affect your ability to perform daily tasks safely (unable to sense temperature of bath water, cannot feel the step with your toe, becoming a fall risk). Patients may have changes in proprioception, which is the ability of the body to be aware of its position. For instance, you can button a shirt without looking because your fingers know how they are bending and moving to perform the task -- this is called proprioception. Without proprioception, your body would not be able to tell the position of the fingers without looking at them. These symptoms are caused by damage to the nerves in the hands and feet. This neuropathy may improve gradually over the months following the discontinuation of treatment, but can become permanent for some patients.

Nausea and/or Vomiting

Talk to your doctor or nurse 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.

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.

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.

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.

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.

Constipation

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](#).

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.

Fever

Fever can be a side effect of this medication. Contact your care provider for a temperature of 100.4°F or 38°C or greater.

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.

Mouth Sores (Mucositis)

Certain cancer treatments can cause [sores or soreness in your mouth](#) and/or throat. Notify your doctor or nurse 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 warm water mouth rinse (2 level teaspoons of baking soda or 1 level teaspoon 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.

Important but Less Common 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 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.
- **Posterior Reversible Encephalopathy Syndrome (PRES):** In rare cases, this medication has caused a neurological disorder called posterior reversible encephalopathy syndrome (PRES), also called reversible posterior leukoencephalopathy (RPLS). Symptoms of PRES/RPLS include headache, seizure, lethargy, confusion, blindness, and other visual and neurological disturbances. Report any of these symptoms to your healthcare team immediately.
 - **Lung Changes:** This medication may cause pulmonary fibrosis (a scarring and stiffening of the lung tissue), particularly when high doses have been received. These problems 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.
 - **Heart problems:** This medication can cause or worsen pre-existing health conditions. Let your care team know if you have had or have cardiac (heart) problems as some of these can become worse on therapy and require ECG monitoring.
 - **Rhabdomyolysis (muscle damage):** Report any muscle pain or weakness, reduced or no urine output, or red-brown colored urine to your healthcare provider.
 - **Hemorrhage:** This medication can cause serious bleeding if you are also taking oral medications to slow down blood clotting. If you have any new or worsening bleeding, call your provider right away.

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 9 months after the last dose for women and 6 months after the final dose for men. 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 while receiving this medication or for 3 months after your last dose.

OncoLink is designed for educational purposes only and is not engaged in rendering medical advice or professional services. The information provided through OncoLink should not be used for diagnosing or treating a health problem or a disease. It is not a substitute for professional care. If you have or suspect you may have a health problem or have questions or concerns about the medication that you have been prescribed, you should consult your health care provider.