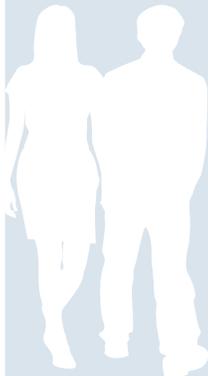


# ALL

Acute  
Lymphoblastic  
Leukemia



## WHAT YOU NEED TO KNOW

You or your loved one has been diagnosed with acute lymphoblastic leukemia (ALL). What does it mean and how will it affect you?

This fact sheet will help you:

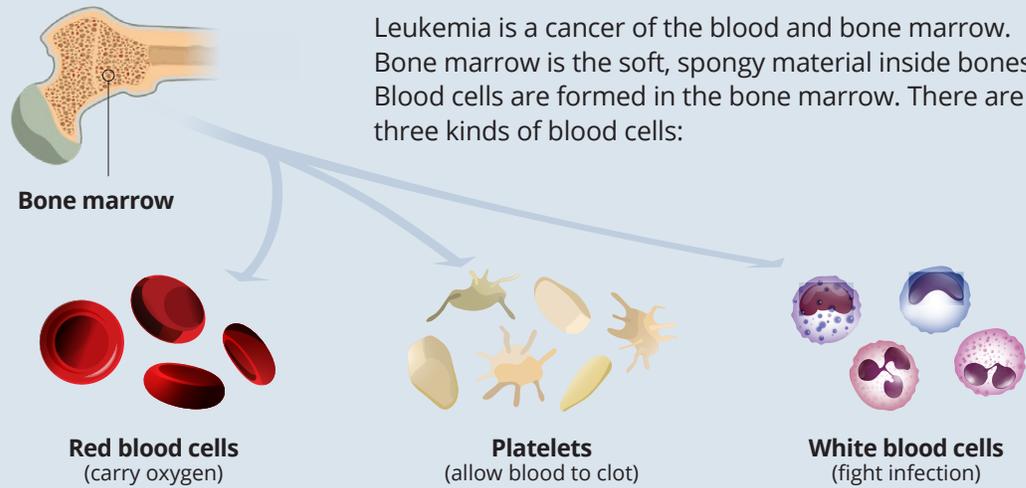
Learn about ALL  
and how it is  
diagnosed

Get an overview  
of treatment  
options

Understand what  
happens next

## What is leukemia?

Leukemia is a cancer of the blood and bone marrow. Bone marrow is the soft, spongy material inside bones. Blood cells are formed in the bone marrow. There are three kinds of blood cells:



When you have leukemia, cancerous blood cells form and push out healthy blood cells.

### About ALL

- One of four main types of leukemia
- Also known as acute lymphocytic leukemia and acute lymphoid leukemia
- Affects immature white blood cells called lymphoblasts
- Progresses quickly without treatment
- Can happen at any age but most often appears in youth under age 20
- Most common cancer found in children
- More common in men than women
- Usually has no clear cause

### Signs and symptoms

If you have ALL, you will likely feel ill because your body is not making enough normal blood cells. You may experience:

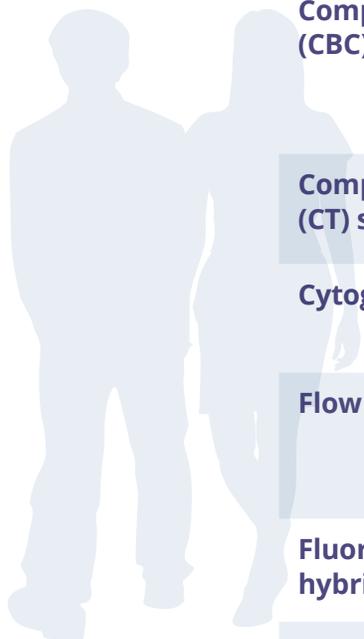
- Fatigue, shortness of breath during normal physical activities, dizziness, and pale complexion
  - When your red blood cell count is low (anemia)
- Ongoing infections and fever
  - When your white blood cell count is low
- Bruising easily, ongoing bleeding from minor cuts, pinhead-sized red spots on your skin, frequent or severe nose bleeds, bleeding gums, and blood in your urine
  - When your platelet count is low
- Night sweats
  - Possibly a response from your immune system
- Bone or joint discomfort
  - When your white blood cells accumulate and cause your bone marrow to expand
- Pain or fullness below the ribs
  - When leukemia cells build up in your liver or spleen, causing your abdomen to swell
- Weight loss
  - When you are eating less or using more energy

The number of people in longer remission lengths from ALL has grown significantly in the last 30 years.

## After your diagnosis

With your diagnosis, your doctor can determine the right treatment for you. Your test results help your doctor predict how ALL will likely progress and how you may respond to treatment.

Name of test	Description
<b>Blood and bone marrow tests</b>	These two tests are usually done at the same time to examine bone marrow cells and look for anything unusual with your chromosomes.
<b>Blood chemistry profile</b>	A blood test will measure any substance released into your blood to determine how well your kidney, liver, and other organs are working.
<b>Cell assessment</b>	This test takes a microscopic look at your blood to determine the size, shape, and type of cells. It also calculates what percentage of your blood contains abnormal immature blood cells (blast cells).
<b>Complete blood count (CBC) with differential</b>	This test measures the number of red blood cells, white blood cells, and platelets in a sample of blood to find out if your counts are high or low. It also measures the levels of hemoglobin (a protein that transports oxygen) in your red blood cells.
<b>Computed tomography (CT) scan</b>	A CT scan uses a computer linked to an x-ray machine to make a series of detailed pictures of areas inside your body.
<b>Cytogenic analysis</b>	This test looks for changes in chromosomes to help identify your ALL subtype.
<b>Flow cytometry</b>	During this test, examiners take cells from your blood or tissue biopsy to determine which proteins or markers (antigens) are in your leukemia cells.
<b>Fluorescence in situ hybridization (FISH)</b>	This lab test looks at the genes and chromosomes in your cells to find ALL cells.
<b>Lumbar puncture</b>	A lumbar puncture (spinal tap) uses a needle inserted between two vertebrae in your back to remove a sample of cerebrospinal fluid (CSF). This test can determine if the leukemia has spread to your CSF.
<b>Magnetic resonance imaging (MRI) scan</b>	An MRI scan uses magnetic fields and radio waves to create images of your organs and tissue. Examiners may also scan your head and/or spinal cord.
<b>Medical history and physical exam</b>	Doctors will review your past illnesses, injuries, and symptoms. They will also examine your lungs, heart, and organs.



## Subtypes of ALL

To diagnose ALL, your testing must show that at least 20% of your bone marrow contains lymphoblasts. Identifying the subtype of your disease is an important step to planning your treatment. Doctors can identify ALL cells through a unique set of proteins found on the surface of those cells.

### Subtypes

- **B-cell lymphoblastic leukemia (B-cell ALL)** is the most common subtype. About 88% of children and 75% of adults with ALL have this subtype.
- **T-cell lymphoblastic leukemia (T-cell ALL)** is less common. About 12% of children and 25% of adults with ALL have this subtype.

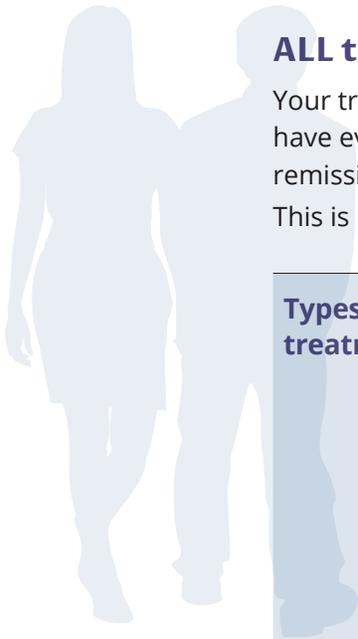
ALL can be further divided into subgroups based on changes to your chromosomes and genes. Your doctor will assess these changes to plan your treatment.

### ALL treatment

Your treatment is focused on destroying as many leukemia cells as possible. When you no longer have evidence of leukemia cells in your body, you are said to be **in remission**. Even with complete remission, some leukemia cells cannot be seen with a microscope and may still be in your body. This is known as minimal residual disease (MRD).

### Types of treatment

- **Chemotherapy** uses medicine (chemicals) to kill cancer cells. Long-term chemotherapy is the current standard treatment for ALL. It includes three phases:
  - **Phase 1: Induction therapy** aims to destroy as many leukemia cells as possible so you can go into remission.
  - **Phase 2: Consolidation therapy** aims to kill any remaining ALL cells after you go into remission.
  - **Phase 3: Maintenance therapy** aims to prevent the disease from returning.
- **Intrathecal chemotherapy** delivers a high dose of chemotherapy into the cerebrospinal fluid (found in the brain and spinal cord) using a lumbar puncture. It is used to treat or protect the nervous system.



### Types of treatment (continued)

- **External beam radiation therapy** uses a machine to direct radiation through the skin to a specific area of the body to destroy cancer cells. For people with ALL, it is applied to the brain (total brain irradiation) to treat leukemia that has spread to the central nervous system and other organs.
- **Targeted therapy** uses drugs or other substances to target and attack specific cancer cells. These treatments are usually less likely to harm normal cells.
- **Immunotherapy** boosts or pauses your immune system to help your body fight cancer. Treatments may use:
  - **Monoclonal antibodies:** Proteins made in a lab that attach to cancer cells to destroy them or carry treatments to them.
  - **Chimeric antigen receptor:** Therapy that uses your T-cells (white blood cells) to kill cancer cells.
  - **Stem cell transplant:** Treatment that destroys cancer cells in the bone marrow with high doses of chemotherapy. Doctors replace them with healthy stem cells.

### Factors that affect treatment

Discuss your treatment options with your doctor to make sure you understand the benefits and risks of each approach. Your treatment plan is based on:

- Age
- Chromosome and/or genetic changes
- Leukemia cells in your brain and spinal cord fluid
- Number of white blood cells
- Response to the first phase of chemotherapy

### Treatment side effects

When you begin your treatment for ALL, you may experience mild to severe side effects, depending on your age, your overall health, and your treatment plan. Most side effects decrease once your body adjusts to treatment or when your treatment ends. New drugs and therapies can help control side effects, such as nausea and vomiting. Speak to your doctor if you are experiencing side effects.

### Common side effects

You may experience side effects such as:

- Itchy skin, headaches, and fatigue from your treatment
- Nausea, vomiting, and loss of appetite from chemotherapy
- Infection from a decrease in white blood cells that can cause side effects such as fever or chills, coughing, sore throat, frequent/loose bowel movements, mouth sores, hair loss, and rashes
- Neuropathy, which is nerve damage from treatment that can make your fingers and toes feel numb or tingle
- Tumour Lysis Syndrome (TLS) when many cancer cells die quickly; TLS changes your metabolism and can lead to other health complications

**Long-term or late effects of treatment**

Medical follow-up is important after treatment for ALL. After the first year of treatment ends, you may need frequent physical exams, blood tests, liver function tests, bone marrow tests, lumbar puncture, and echocardiogram.

During the second and third years following your treatment, you will need fewer physical exams and blood tests. Your medical team should provide you with a care plan listing the frequency of follow-up visits and the tests you will have at those visits.

- **Long-term side effects** are common and can last for months or years after treatment ends. One example is fatigue.
- **Late effects** are medical problems that do not show up until years after treatment ends. See your doctor to get follow-up care for possible early detection of heart damage, other cancers, and neurological or cognitive issues.
- **Children** can experience side effects that affect learning, growth, cognitive (brain) development, and their social and psychological development.



Seek medical help if you are feeling “down” or “blue” or don’t want to do anything – and your mood does not improve over time. These could be signs of depression, an illness that should be treated even when you’re undergoing treatment for ALL. Treatment for depression has important benefits for people living with cancer.

This fact sheet was reviewed by:

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LEUKEMIA &  
LYMPHOMA  
SOCIETY  
OF CANADA\*

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