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Leukemia

What is leukemia?

Leukemia [<https://medlineplus.gov/leukemia.html>] is a term for cancers of the blood cells. Leukemia starts in blood-forming tissues such as the bone marrow. Your bone marrow makes the cells which will develop into white blood cells, red blood cells, and platelets. Each type of cell has a different job:

- White blood cells help your body fight infection
- Red blood cells deliver oxygen from your lungs to your tissues and organs
- Platelets [<https://medlineplus.gov/plateletdisorders.html>] help form clots to stop bleeding

When you have leukemia, your bone marrow makes large numbers of abnormal cells. This problem most often happens with white blood cells. These abnormal cells build up in your bone marrow and blood. They crowd out the healthy blood cells and make it hard for your cells and blood to do their work.

What are the types of leukemia?

There are different types of leukemia. Which type of leukemia you have depends on the type of blood cell that becomes cancer and whether it grows quickly or slowly.

The type of blood cell could be:

- **Lymphocytes**, a type of white blood cell
- **Myeloid cells**, immature cells that become white blood cells, red blood cells, or platelets

The different types can grow quickly or slowly:

- **Acute leukemia** is fast growing. It usually gets worse quickly if it's not treated.
- **Chronic leukemia** is slow growing. It usually gets worse over a longer period of time.

The main types of leukemia are:

- Acute lymphocytic leukemia (ALL) [<https://medlineplus.gov/acuteleukemia.html>] , which is the most common type of cancer in children. It can also affect adults.
- Acute myeloid leukemia (AML) [<https://medlineplus.gov/acuteleukemia.html>] , which is more common in older adults but can also affect children
- Chronic lymphocytic leukemia (CLL) [<https://medlineplus.gov/chronicleukemia.html>] , which is one of the most common types of leukemia in adults. It often occurs during or after middle age.
- Chronic myeloid leukemia (CML) [<https://medlineplus.gov/chronicleukemia.html>] , which usually occurs in adults during or after middle age

What causes leukemia?

Leukemia happens when there are changes in the genetic material (DNA) in bone marrow cells. The cause of these genetic changes is unknown.

Who is at risk for leukemia?

For the specific types, there are different factors which can raise your risk of getting that type. Overall, your risk of leukemia goes up as you age. It is most common over age 60.

What are the symptoms of leukemia?

Some of the symptoms of leukemia may include:

- Feeling tired [<https://medlineplus.gov/fatigue.html>]
- Fever [<https://medlineplus.gov/fever.html>] or night sweats
- Easy bruising [<https://medlineplus.gov/bruises.html>] or bleeding [<https://medlineplus.gov/bleeding.html>]
- Weight loss or loss of appetite
- Petechiae, which are tiny red dots under the skin. They are caused by bleeding.

Other leukemia symptoms can be different from type to type. Chronic leukemia may not cause symptoms at first.

How is leukemia diagnosed?

Your health care provider may use many tools to diagnose leukemia:

- A physical exam
- A medical history
- Blood tests, such as a complete blood count (CBC) [<https://medlineplus.gov/lab-tests/complete-blood-count-cbc/>]
- Bone marrow tests [<https://medlineplus.gov/lab-tests/bone-marrow-tests/>] . There are two main types - bone marrow aspiration and bone marrow biopsy. Both tests involve removing a sample of bone marrow and bone. The samples are sent to a lab for testing.
- Genetic tests [<https://medlineplus.gov/genetictesting.html>] to look for gene and chromosome changes

Once the provider makes a diagnosis, there may be additional tests to see whether the cancer has spread. These include imaging tests and a lumbar puncture, which is a procedure to collect and test cerebrospinal fluid (CSF).

What are the treatments for leukemia?

The treatments for leukemia depend on which type you have, how severe the leukemia is, your age, your overall health, and other factors. Some possible treatments might include:


- Chemotherapy [<https://medlineplus.gov/cancerchemotherapy.html>]
- Radiation therapy [<https://medlineplus.gov/radiationtherapy.html>]
- Chemotherapy with stem cell transplant [<https://medlineplus.gov/stemcells.html>]
- Targeted therapy, which uses drugs or other substances that attack specific cancer cells with less harm to normal cells






NIH: National Cancer Institute

Start Here





- Leukemia [<https://www.mayoclinic.org/diseases-conditions/leukemia/symptoms-causes/syc-20374373?p=1>]
(Mayo Foundation for Medical Education and Research)
Also in Spanish [<https://www.mayoclinic.org/es/diseases-conditions/leukemia/symptoms-causes/syc-20374373?p=1>]
- Understanding Leukemia
[https://www.lls.org/sites/default/files/file_assets/PS70_UnderstandingLeukemia_Eng_4_15reprint.pdf]
(Leukemia & Lymphoma Society) - **PDF**
Also in Spanish [[https://www.lls.org/sites/default/files/2021-05/PS77_UnderstandLeukemia_Guide_SP_4_15reprint%20\(1\).pdf](https://www.lls.org/sites/default/files/2021-05/PS77_UnderstandLeukemia_Guide_SP_4_15reprint%20(1).pdf)]

Diagnosis and Tests


- Beta 2 Microglobulin (B2M) Tumor Marker Test [<https://medlineplus.gov/lab-tests/beta-2-microglobulin-b2m-tumor-marker-test/>]  (National Library of Medicine)
Also in Spanish [<https://medlineplus.gov/spanish/pruebas-de-laboratorio/prueba-de-marcador-tumoral-de-microglobulina-beta-2-b2m/>]

- Blood Count Tests:** MedlinePlus Health Topic [<https://medlineplus.gov/bloodcounttests.html>]  (National Library of Medicine)
Also in Spanish [<https://medlineplus.gov/spanish/bloodcounttests.html>]
- Blood Tests** [<https://www.nhlbi.nih.gov/health/blood-tests>]  (National Heart, Lung, and Blood Institute)
Also in Spanish [<https://www.nhlbi.nih.gov/es/salud/analisis-de-sangre>]
- Bone Marrow Test** [<https://medlineplus.gov/lab-tests/bone-marrow-tests/>]  (National Library of Medicine)
Also in Spanish [<https://medlineplus.gov/spanish/pruebas-de-laboratorio/prueba-de-la-medula-osea/>]
- How Is Chronic Myelomonocytic Leukemia Diagnosed?** [<https://www.cancer.org/cancer/types/chronic-myelomonocytic-leukemia/detection-diagnosis-staging/how-diagnosed.html>] (American Cancer Society)
- Lab and Imaging Tests** [<https://www.lls.org/treatment/lab-and-imaging-tests>] (Leukemia & Lymphoma Society)
Also in Spanish [https://www.lls.org/sites/default/files/2021-05/PS41S_SP_Understanding_Labs_FINAL_2020.pdf]
- TP53 Genetic Test** [<https://medlineplus.gov/lab-tests/tp53-genetic-test/>]  (National Library of Medicine)
Also in Spanish [<https://medlineplus.gov/spanish/pruebas-de-laboratorio/prueba-genetica-tp-53-proteina-tumoral-53/>]
- Tumor Marker Tests** [<https://medlineplus.gov/lab-tests/tumor-marker-tests/>]  (National Library of Medicine)
Also in Spanish [<https://medlineplus.gov/spanish/pruebas-de-laboratorio/marcadores-tumorales/>]


Treatments and Therapies

- Blood Transfusion** [<https://www.lls.org/treatment/types-treatment/blood-transfusion>] (Leukemia & Lymphoma Society)
- Bone Marrow Transplantation: MedlinePlus Health Topic** [<https://medlineplus.gov/bonemarrowtransplantation.html>]  (National Library of Medicine)
Also in Spanish [<https://medlineplus.gov/spanish/bonemarrowtransplantation.html>]
- Choosing a Blood Cancer Specialist** [<https://www.lls.org/treatment/choosing-blood-cancer-specialist-or-treatment-center/choosing-blood-cancer-specialist>] (Leukemia & Lymphoma Society)
Also in Spanish [https://www.lls.org/sites/default/files/2021-05/FS6S_ChoosingABCSOTC%20Facts_Span.pdf]
- Chronic Myeloproliferative Neoplasms Treatment** [<https://www.cancer.gov/types/myeloproliferative/patient/chronic-treatment-pdq>]  (National Cancer Institute)
Also in Spanish [https://www.cancer.gov/espanol/tipos/mieloproliferativas/paciente/tratamiento-cronicas-pdq#_164]
- Drugs Approved for Leukemia** [<https://www.cancer.gov/about-cancer/treatment/drugs/leukemia>]  (National Cancer Institute)
- General Approach to Treatment of Chronic Myelomonocytic Leukemia** [<https://www.cancer.org/cancer/types/chronic-myelomonocytic-leukemia/treating/general-approach.html>] (American Cancer Society)
- Immunotherapy** [<https://www.lls.org/treatment/types-treatment/immunotherapy>] (Leukemia & Lymphoma Society)
Also in Spanish [https://www.lls.org/sites/default/files/file_assets/FS9S_SP_Immunotherapy2020.pdf]
- Integrative Medicine and Complementary and Alternative Therapies** [<https://www.lls.org/treatment/integrative-medicine-and-complementary-therapies>] (Leukemia & Lymphoma Society)
Also in Spanish [https://www.lls.org/sites/default/files/2022-05/FS8S_Integrative_Medicine_Complementary_Therapies_04.22_Spanish.pdf]
- Treatment Option Overview (Hairy Cell Leukemia)** [https://www.cancer.gov/types/leukemia/patient/hairy-cell-treatment-pdq#_34]  (National Cancer Institute)
Also in Spanish [https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-celulas-pilosas-pdq#_85]

Related Issues

- Electromagnetic Fields and Cancer** [<https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/electromagnetic-fields-fact-sheet>]  (National Cancer Institute)
Also in Spanish [<https://www.cancer.gov/espanol/cancer/causas-prevencion/riesgo/radiacion/hoja-informativa-campos-electromagneticos>]

Specifics

- Adult T-Cell Leukemia/Lymphoma** [<https://lymphoma.org/understanding-lymphoma/aboutlymphoma/nhl/atll/>] (Lymphoma Research Foundation)
- General Information About Hairy Cell Leukemia** [https://www.cancer.gov/types/leukemia/patient/hairy-cell-treatment-pdq#_1]  (National Cancer Institute)



Also in Spanish [<https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-celulas-pilosas-pdq>]

- What Is Chronic Myelomonocytic Leukemia? [<https://www.cancer.org/cancer/types/chronic-myelomonocytic-leukemia/about/what-is-chronic-myelomonocytic.html>] (American Cancer Society)



Genetics

- Do We Know What Causes Chronic Myelomonocytic Leukemia? [<https://www.cancer.org/cancer/types/chronic-myelomonocytic-leukemia/causes-risks-prevention/what-causes.html>] (American Cancer Society)

Statistics and Research

- Advances in Leukemia Research [<https://www.cancer.gov/types/leukemia/research>]  (National Cancer Institute)
- Cancer Statistics: Leukemia [<https://seer.cancer.gov/statfacts/html/leuks.html>]  (National Cancer Institute)
- Facts and Statistics [<https://www.lls.org/facts-and-statistics/facts-and-statistics-overview>] (Leukemia & Lymphoma Society)

Clinical Trials

- ClinicalTrials.gov: Leukemia [<https://clinicaltrials.gov/search?cond=%22Leukemia%22&aggFilters=status:not%20rec>]  (National Institutes of Health)
- ClinicalTrials.gov: Leukemia, Hairy Cell [<https://clinicaltrials.gov/search?cond=%22Leukemia,+Hairy+Cell%22&aggFilters=status:not%20rec>]  (National Institutes of Health)
- Types of Treatment: Clinical Trials [<https://www.lls.org/treatment/types-treatment/clinical-trials>] (Leukemia & Lymphoma Society)

Journal Articles


References and abstracts from MEDLINE/PubMed (National Library of Medicine)

- Article: Natural Nrf2 activators modulate antioxidant gene expression and apoptosis in leukemic... [<https://www.ncbi.nlm.nih.gov/pubmed/40742622>]
- Article: Death of Leukemia Cells and Platelets Induced by 3,3'-Dihydroxy-4,5-Dimethoxybibenzyl Is Mediated... [<https://www.ncbi.nlm.nih.gov/pubmed/40733232>]
- Article: Identification of a novel immature dendritic cell subset with potential pro-leukemic... [<https://www.ncbi.nlm.nih.gov/pubmed/40730800>]
- Leukemia -- see more articles [<https://pubmed.ncbi.nlm.nih.gov/?term=%22Leukemia%22%5Bmajr%3Anoexp%5D+AND+humans%5Bmh%5D+AND+english%5Bla%5D+AND+%22last+1+Year%22+%5Bedat%5D+NOT+%28letter%5Bpt%5D+OR+case+reports%5Bpt%5D+OR+editorial%5Bpt%5D+OR+comment%5Bpt%5D%29+AND+free+full+text%5Bsb%5D+>]

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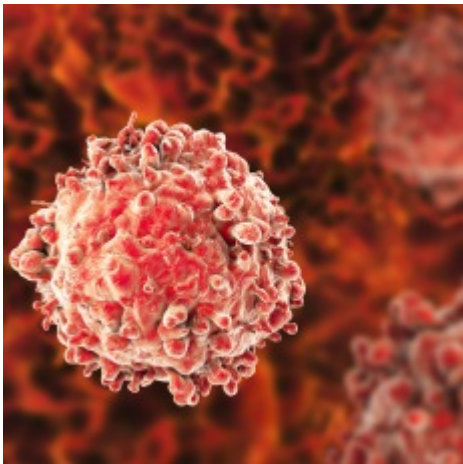
- American Cancer Society [<https://www.cancer.org/>]
- Choosing a Cancer Doctor [<https://www.cancer.org/cancer/managing-cancer/finding-care/where-to-find-cancer-care/choosing-a-cancer-doctor.html>] (American Cancer Society)
Also in Spanish [<https://www.cancer.org/es/cancer/como-sobrellevar-el-cancer/encontrar-tratamiento/como-elegir-un-medico-y-un-hospital/como-seleccionar-a-un-medico.html>]
- Leukemia & Lymphoma Society [<https://www.lls.org/>]
Also in Spanish [<https://www.lls.org/node/1690491>]
- National Cancer Institute [<https://www.cancer.gov/>] 
Also in Spanish [<https://www.cancer.gov/espanol>]
- NCI - Designated Cancer Centers [<https://www.cancer.gov/research/infrastructure/cancer-centers>] 
Also in Spanish [<https://www.cancer.gov/espanol/investigacion/infraestructura/centros-oncologicos>]

Children

- Childhood Leukemia: MedlinePlus Health Topic [<https://medlineplus.gov/childhoodleukemia.html>]
 (National Library of Medicine)
Also in Spanish [<https://medlineplus.gov/spanish/childhoodleukemia.html>]
- Leukemia [<https://kidshealth.org/en/parents/cancer-leukemia.html>] (Nemours Foundation)
Also in Spanish [<https://kidshealth.org/es/parents/cancer-leukemia.html>]

Patient Handouts

- B-cell leukemia/lymphoma panel [<https://medlineplus.gov/ency/article/003518.htm>] (Medical Encyclopedia)
Also in Spanish [<https://medlineplus.gov/spanish/ency/article/003518.htm>]
- Bone marrow transplant [<https://medlineplus.gov/ency/article/003009.htm>] (Medical Encyclopedia)
Also in Spanish [<https://medlineplus.gov/spanish/ency/article/003009.htm>]
- Hairy cell leukemia [<https://medlineplus.gov/ency/article/000592.htm>] (Medical Encyclopedia)
Also in Spanish [<https://medlineplus.gov/spanish/ency/article/000592.htm>]
- Leukemia [<https://medlineplus.gov/ency/article/001299.htm>] (Medical Encyclopedia)
Also in Spanish [<https://medlineplus.gov/spanish/ency/article/001299.htm>]



MEDICAL ENCYCLOPEDIA

- After chemotherapy - discharge [<https://medlineplus.gov/ency/patientinstructions/000012.htm>]
- B and T cell screen [<https://medlineplus.gov/ency/article/003329.htm>]
- B-cell leukemia/lymphoma panel [<https://medlineplus.gov/ency/article/003518.htm>]
- Bone marrow biopsy [<https://medlineplus.gov/ency/article/003934.htm>]
- Bone marrow transplant [<https://medlineplus.gov/ency/article/003009.htm>]
- Bone marrow transplant - discharge [<https://medlineplus.gov/ency/patientinstructions/000010.htm>]
- Bone-marrow transplant - series [https://medlineplus.gov/ency/presentations/100112_1.htm]
- Cryoglobulins [<https://medlineplus.gov/ency/article/003555.htm>]
- Fibrinopeptide A blood test [<https://medlineplus.gov/ency/article/003373.htm>]
- Hairy cell leukemia [<https://medlineplus.gov/ency/article/000592.htm>]
- Leukemia [<https://medlineplus.gov/ency/article/001299.htm>]
- T-cell count [<https://medlineplus.gov/ency/article/003516.htm>]

Related Health Topics

Acute Lymphocytic Leukemia [<https://medlineplus.gov/acuteleukemicleukemia.html>]

Acute Myeloid Leukemia [<https://medlineplus.gov/acuteleukemicleukemia.html>]

Childhood Leukemia [<https://medlineplus.gov/childhoodleukemia.html>]

Chronic Lymphocytic Leukemia [<https://medlineplus.gov/chronicleukemicleukemia.html>]

Chronic Myeloid Leukemia [<https://medlineplus.gov/chronicleukemicleukemia.html>]

National Institutes of Health

The primary NIH organization for research on *Leukemia* is the National Cancer Institute [<http://www.cancer.gov/>]

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