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## Childhood 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 in children?

There are different types of leukemia. Some types are acute (fast growing). They usually get worse quickly if they are not treated. Most childhood leukemias are acute:

- **Acute lymphocytic leukemia (ALL)**, which is the most common type of leukemia in children and the most common cancer in children [<https://medlineplus.gov/cancerinchildren.html>] . In ALL, the bone marrow makes too many lymphocytes, a type of white blood cell.
- **Acute myeloid leukemia (AML)**, which happens when bone marrow makes abnormal myeloblasts (a type of white blood cell), red blood cells, or platelets.

Other types of leukemia are chronic (slow growing). They usually get worse over a longer period of time. They are rare in children:

- **Chronic lymphocytic leukemia (CLL)**, in which the bone marrow makes abnormal lymphocytes (a type of white blood cell). It is more common in teens than children.
- **Chronic myeloid leukemia (CML)**, in which the bone marrow makes abnormal granulocytes (a type of white blood cell). It is very rare in children.

There are some other rare types of leukemia in children, including juvenile myelomonocytic leukemia (JMML).

### What causes leukemia in children?

Leukemia happens when there are changes in the genetic material (DNA) in bone marrow cells. The cause of these genetic changes is unknown. However, there are certain factors that raise the risk of childhood leukemia.

### Who is at risk for leukemia in children?

The factors that raise the risk of childhood leukemia include:

- Having a brother or sister, especially a twin, with leukemia

- Past treatment with chemotherapy [<https://medlineplus.gov/cancerchemotherapy.html>]
- Exposure to radiation [<https://medlineplus.gov/radiationexposure.html>] , including radiation therapy [<https://medlineplus.gov/radiationtherapy.html>]
- Having certain genetic conditions [<https://medlineplus.gov/geneticdisorders.html>] , such as
  - Ataxia telangiectasia [<https://medlineplus.gov/ataxiatelangiectasia.html>]
  - Down syndrome [<https://medlineplus.gov/downsyndrome.html>]
  - Fanconi anemia
  - Li-Fraumeni syndrome
  - Neurofibromatosis type 1 [<https://medlineplus.gov/neurofibromatosis.html>]

There are other factors that may raise the risk of getting one or more of the specific types of childhood leukemia.

## What are the symptoms of leukemia in children?

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 in children 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 there is a diagnosis of leukemia, other tests may be done to see whether the cancer has spread. These include imaging tests [<https://medlineplus.gov/diagnosticimaging.html>] and a lumbar puncture, which is a procedure to collect and test cerebrospinal fluid (CSF).

## What are the treatments for leukemia in children?

The treatments for leukemia depend on which type it is, how severe the leukemia is, the child's age, and other factors.

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

Treatment for childhood leukemia is often successful. But the treatments can cause complications right away or later in life. Children who survived leukemia will need follow-up care the rest of their lives to watch for and treat any complications they may have.

## Start Here

- General Information about Childhood Acute Lymphoblastic Leukemia [<https://www.cancer.gov/types/leukemia/patient/child-all-treatment-pdq>]  (National Cancer Institute)  
Also in Spanish [<https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lla-infantil-pdq>]
- General Information about Childhood Acute Myeloid Leukemia and Other Myeloid Malignancies [[https://www.cancer.gov/types/leukemia/patient/child-aml-treatment-pdq#\\_1](https://www.cancer.gov/types/leukemia/patient/child-aml-treatment-pdq#_1)]  (National Cancer Institute)  
Also in Spanish [<https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lma-infantil-pdq>]
- Leukemia [<https://kidshealth.org/en/parents/cancer-leukemia.html>] (Nemours Foundation)  
Also in Spanish [<https://kidshealth.org/es/parents/cancer-leukemia.html>]
- What Is Childhood Leukemia? [<https://www.cancer.org/cancer/types/leukemia-in-children/about/what-is-childhood-leukemia.html>] (American Cancer Society)  
Also in Spanish [<https://www.cancer.org/es/cancer/tipos/leucemia-en-ninos/acerca/que-es-leucemia-en-ninos.html>]

## Symptoms

- Signs and Symptoms of Childhood Leukemia [<https://www.cancer.org/cancer/types/leukemia-in-children/detection-diagnosis-staging/signs-and-symptoms.html>] (American Cancer Society)  
Also in Spanish [<https://www.cancer.org/es/cancer/tipos/leucemia-en-ninos/deteccion-diagnostico-clasificacion-por-etapas/senales-y-sintomas.html>]

## Diagnosis and Tests

- BCR ABL Genetic Test [<https://medlineplus.gov/lab-tests/bcr-abl-genetic-test/>]  (National Library of Medicine)  
Also in Spanish [<https://medlineplus.gov/spanish/pruebas-de-laboratorio/prueba-genetica-bcr-abl/>]
- 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>]
- Childhood Leukemia Subtypes [<https://www.cancer.org/cancer/types/leukemia-in-children/detection-diagnosis-staging/how-classified.html>] (American Cancer Society)  
Also in Spanish [<https://www.cancer.org/es/cancer/tipos/leucemia-en-ninos/deteccion-diagnostico-clasificacion-por-etapas/como-se-clasifica.html>]
- Pharmacogenetic Tests [<https://medlineplus.gov/lab-tests/pharmacogenetic-tests/>]  (National Library of Medicine)  
Also in Spanish [<https://medlineplus.gov/spanish/pruebas-de-laboratorio/pruebas-farmacogeneticas/>]
- Stages of Childhood Acute Myeloid Leukemia and Other Myeloid Malignancies [[https://www.cancer.gov/types/leukemia/patient/child-aml-treatment-pdq#\\_30](https://www.cancer.gov/types/leukemia/patient/child-aml-treatment-pdq#_30)]  (National Cancer Institute)  
Also in Spanish [[https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lma-infantil-pdq#\\_30](https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lma-infantil-pdq#_30)]
- Tests for Childhood Leukemia [<https://www.cancer.org/cancer/types/leukemia-in-children/detection-diagnosis-staging/how-diagnosed.html>] (American Cancer Society)  
Also in Spanish [<https://www.cancer.org/es/cancer/tipos/leucemia-en-ninos/deteccion-diagnostico-clasificacion-por-etapas/como-se-diagnosticata.html>]

## Prevention and Risk Factors

- Risk Factors for Childhood Leukemia [<https://www.cancer.org/cancer/types/leukemia-in-children/causes-risks-prevention/risk-factors.html>] (American Cancer Society)  
Also in Spanish [<https://www.cancer.org/es/cancer/tipos/leucemia-en-ninos/causas riesgos prevencion factores de riesgo.html>]
- Risk Groups for Childhood Acute Lymphoblastic Leukemia [[https://www.cancer.gov/types/leukemia/patient/child-all-treatment-pdq#\\_26](https://www.cancer.gov/types/leukemia/patient/child-all-treatment-pdq#_26)]  (National Cancer Institute)  
Also in Spanish [[https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lla-infantil-pdq#\\_50](https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lla-infantil-pdq#_50)]

## 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>]
- Immunotherapy to Treat Cancer (For Parents) [<https://kidshealth.org/en/parents/immunotherapy.html>] (Nemours Foundation)
- 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](https://www.lls.org/sites/default/files/2022-05/FS8S_Integrative_Medicine_Complementary_Therapies_04.22_Spanish.pdf)]
- Prognostic Factors in Childhood Leukemia (ALL or AML) [<https://www.cancer.org/cancer/types/leukemia-in-children/detection-diagnosis-staging/prognostic-factors.html>] (American Cancer Society)  
Also in Spanish [<https://www.cancer.org/es/cancer/tipos/leucemia-en-ninos/deteccion-diagnostico-clasificacion-por-etapas/factores-pronosticos.html>]
- Treatment Option Overview (Childhood Acute Lymphoblastic Leukemia) [[https://www.cancer.gov/types/leukemia/patient/child-all-treatment-pdq#\\_32](https://www.cancer.gov/types/leukemia/patient/child-all-treatment-pdq#_32)]  (National Cancer Institute)  
Also in Spanish [[https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lla-infantil-pdq#\\_63](https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lla-infantil-pdq#_63)]
- Treatment Option Overview (Childhood Acute Myeloid Leukemia/Other Myeloid Malignancies) [[https://www.cancer.gov/types/leukemia/patient/child-aml-treatment-pdq#\\_36](https://www.cancer.gov/types/leukemia/patient/child-aml-treatment-pdq#_36)]  (National Cancer Institute)  
Also in Spanish [[https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lma-infantil-pdq#\\_36](https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lma-infantil-pdq#_36)]

## Living With

- Children with Cancer: A Guide for Parents [<https://www.cancer.gov/publications/patient-education/guide-for-parents>]  (National Cancer Institute)
- Coping with Childhood Leukemia and Lymphoma [[https://www.lls.org/sites/default/files/file\\_assets/childhoodleukemialymphoma.pdf](https://www.lls.org/sites/default/files/file_assets/childhoodleukemialymphoma.pdf)] (Leukemia & Lymphoma Society) - PDF
- Going to School during and after Cancer Treatment [<https://www.cancer.org/cancer/childhood-cancer/going-to-school-during-and-after-cancer-treatment.html>] (American Cancer Society)  
Also in Spanish [<https://www.cancer.org/es/cancer/cancer-infantil/ir-a-la-escuela-durante-el-tratamiento-del-cancer-y-despues.html>]
- Support for Families when a Child Has Cancer [<https://www.cancer.gov/about-cancer/coping/caregiver-support/parents>]  (National Cancer Institute)  
Also in Spanish [<https://www.cancer.gov/espanol/cancer/sobrelevar/apoyo-a-quien-cuida/padres>]

## 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>]
- Late Effects of Treatment for Childhood Cancer [<https://www.cancer.gov/types/childhood-cancers/late-effects-pdq>]  (National Cancer Institute)  
Also in Spanish [<https://www.cancer.gov/espanol/tipos/infantil/efectos-tardios-pdq>]

## Specifics

- Acute Lymphoblastic Leukemia (ALL) [<https://kidshealth.org/en/parents/all.html>] (Nemours Foundation)  
Also in Spanish [<https://kidshealth.org/es/parents/all.html>]
- Chronic Myelogenous Leukemia (CML) (For Parents) [<https://kidshealth.org/en/parents/cml.html>] (Nemours Foundation)  
Also in Spanish [<https://kidshealth.org/es/parents/cml.html>]

## Statistics and Research

- Advances in Leukemia Research [<https://www.cancer.gov/types/leukemia/research>]  (National Cancer Institute)

- Cancer in Children and Adolescents [<https://www.cancer.gov/types/childhood-cancers/child-adolescent-cancers-fact-sheet>]  (National Cancer Institute)  
Also in Spanish [<https://www.cancer.gov/espanol/tipos/infantil/hoja-informativa-ninos-adolescentes>]
- Key Statistics for Childhood Leukemia [<https://www.cancer.org/cancer/types/leukemia-in-children/about/key-statistics.html>] (American Cancer Society)  
Also in Spanish [<https://www.cancer.org/es/cancer/tipos/leucemia-en-ninos/acerca/estadisticas-clave.html>]

## Clinical Trials

- ClinicalTrials.gov: Childhood Leukemia [<https://clinicaltrials.gov/search?cond=leukemia&aggFilters=ages:child,status:not%20rec>]  (National Institutes of Health)

## Journal Articles

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

- Article: Retrospective panoramic radiographic evaluation of acute leukemia patients with fractal analysis. [<https://www.ncbi.nlm.nih.gov/pubmed/40713547>]
- Article: Impact of Family-Centred Continuity of Care on Depression, Anxiety, Self-Esteem, and... [<https://www.ncbi.nlm.nih.gov/pubmed/40705546>]
- Article: Risk of early death after acute leukemia diagnosis among adolescents and... [<https://www.ncbi.nlm.nih.gov/pubmed/40579211>]
- Childhood Leukemia -- see more articles [<https://pubmed.ncbi.nlm.nih.gov/?term=%22Leukemia%22%5Bmajr%3Anoexp%5D+AND+adolescence+%5Bmh%3Anoexp%5D+AND+humans%5Bmh%5D+AND+english%5Bla%5D+AND+%22last+1+Year%22+%5Bdat%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+>]

## Find an Expert

- 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-sobrelevar-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>]   
(National Cancer Institute)  
Also in Spanish [<https://www.cancer.gov/espanol/investigacion/infraestructura/centros-oncologicos>]

## Patient Handouts

- Acute lymphocytic leukemia (ALL) [<https://medlineplus.gov/ency/article/000541.htm>] (Medical Encyclopedia)  
Also in Spanish [<https://medlineplus.gov/spanish/ency/article/000541.htm>]
- Acute myelogenous leukemia (AML) -- children [<https://medlineplus.gov/ency/article/007656.htm>] (Medical Encyclopedia)  
Also in Spanish [<https://medlineplus.gov/spanish/ency/article/007656.htm>]
- Bone marrow transplant [<https://medlineplus.gov/ency/article/003009.htm>] (Medical Encyclopedia)  
Also in Spanish [<https://medlineplus.gov/spanish/ency/article/003009.htm>]
- Leukemia [<https://medlineplus.gov/ency/article/001299.htm>] (Medical Encyclopedia)  
Also in Spanish [<https://medlineplus.gov/spanish/ency/article/001299.htm>]



## MEDICAL ENCYCLOPEDIA

Acute lymphocytic leukemia (ALL) [<https://medlineplus.gov/ency/article/000541.htm>]

Acute myelogenous leukemia (AML) -- children [<https://medlineplus.gov/ency/article/007656.htm>]

After chemotherapy - discharge [<https://medlineplus.gov/ency/patientinstructions/000012.htm>]

B and T cell screen [<https://medlineplus.gov/ency/article/003329.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](https://medlineplus.gov/ency/presentations/100112_1.htm)]

Chronic myelogenous leukemia (CML) [<https://medlineplus.gov/ency/article/000570.htm>]

Cryoglobulins [<https://medlineplus.gov/ency/article/003555.htm>]

Eating extra calories when you are sick - children [<https://medlineplus.gov/ency/patientinstructions/000034.htm>]

Fibrinopeptide A blood test [<https://medlineplus.gov/ency/article/003373.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/acutelymphocyticleukemia.html>]

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

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

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

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

## National Institutes of Health

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

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