URL of this page: https://medlineplus.gov/chronicmyeloidleukemia.html

Chronic Myeloid Leukemia

Also called: Chronic granulocytic leukemia, Chronic myelogenous leukemia, CML

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 is chronic myeloid leukemia (CML)?

Chronic myeloid leukemia (CML) is a type of chronic leukemia. "Chronic" means that the leukemia usually gets worse slowly. In CML, the bone marrow makes abnormal granulocytes (a type of white blood cell). These abnormal cells are also called blasts. When the abnormal cells crowd out the healthy cells, it can lead to infection, anemia [https://medlineplus.gov/anemia.html] , and easy bleeding [https://medlineplus.gov/bleedingdisorders.html] . The abnormal cells can also spread outside the blood to other parts of the body.

CML usually occurs in adults during or after middle age. It is rare in children [https://medlineplus.gov/childhoodleukemia.html] .

What causes chronic myeloid leukemia (CML)?

Most people with CML have a genetic change [https://medlineplus.gov/genetics/condition/chronic-myeloid-leukemia/#causes] called the Philadelphia chromosome. It's called that because researchers in Philadelphia discovered it. People normally have 23 pairs of chromosomes in each cell. These chromosomes contain your DNA (genetic material). In CML, part of the DNA from one chromosome moves to another chromosome. It combines with some DNA there, which creates a new gene called BCR-ABL. This gene causes your bone marrow to make an abnormal protein. This protein allows the leukemia cells to grow out of control.

The Philadelphia chromosome isn't passed from parent to child. It happens during your lifetime. The cause is unknown.

Who is at risk for chronic myeloid leukemia (CML)?

It is hard to predict who will get CML. There are a few factors that could raise your risk:

- Age - your risk goes up as you get older
- CML is slightly more common in men
- Exposure to high-dose radiation [https://medlineplus.gov/radiationexposure.html]

What are the symptoms of chronic myeloid leukemia (CML)?

Sometimes CML does not cause symptoms. If you do have symptoms, they can include:

- Feeling very tired [https://medlineplus.gov/fatigue.html]
- Weight loss for no known reason
- Drenching night sweats
- Fever [https://medlineplus.gov/fever.html]
- Pain or a feeling of fullness below the ribs on the left side

How is chronic myeloid leukemia (CML) diagnosed?

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

- A physical exam
- A medical history
- Blood tests, such as a complete blood count (CBC) with differential [https://medlineplus.gov/lab-tests/complete-blood-count-cbc/] and blood chemistry tests. Blood chemistry tests measure different substances in the blood, including electrolytes, fats, proteins, glucose (sugar), and enzymes. Specific blood chemistry tests include a basic metabolic panel (BMP) [https://medlineplus.gov/lab-tests/basic-metabolic-panel-bmp/] , a comprehensive metabolic panel (CMP) [https://medlineplus.gov/lab-tests/comprehensive-metabolic-panel-cmp/] , kidney function tests [https://medlineplus.gov/kidneytests.html] , liver function tests [https://medlineplus.gov/lab-tests/liver-function-tests/] , and an electrolyte panel [https://medlineplus.gov/lab-tests/electrolyte-panel/] .
- 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, including tests to look for the Philadelphia chromosome

If you are diagnosed with CML, you may have additional tests such as imaging tests to see whether the cancer has spread.

What are the phases of chronic myeloid leukemia (CML)?

CML has three phases. The phases are based on how much the CML has grown or spread:

- Chronic phase, where less than 10% of cells in the blood and bone marrow are blast cells (leukemia cells). Most people are diagnosed in this phase, and many do not have symptoms. Standard treatment usually helps in this phase.
- Accelerated phase, 10% to 19% of the cells in the blood and bone marrow are blast cells. In this phase, people often have symptoms and standard treatment may not be as effective as in the chronic phase.
- Blastic phase, where 20% or more of the cells in the blood or bone marrow are blast cells. The blast cells have spread to other tissues and organs. If you have tiredness, fever, and an enlarged spleen during the blastic phase, it is called a blast crisis. This phase is harder to treat.

What are the treatments for chronic myeloid leukemia (CML)?

There are several different treatments for CML:

- Targeted therapy, which uses drugs or other substances that attack specific cancer cells with less harm to normal cells. For CML, the drugs are tyrosine kinase inhibitors (TKIs). They block tyrosine kinase, which is an enzyme that causes your bone marrow to make too many blasts.
- Chemotherapy [https://medlineplus.gov/cancerchemotherapy.html]
- Immunotherapy [https://medlineplus.gov/cancerimmunotherapy.html]
- High-dose chemotherapy with stem cell transplant [https://medlineplus.gov/stemcells.html]
- Donor lymphocyte infusion (DLI). DLI is a treatment that may be used after a stem cell transplant. It involves giving you an infusion (into your bloodstream) of healthy lymphocytes from the stem cell transplant donor. Lymphocytes are a type of white blood cell. These donor lymphocytes may kill the remaining cancer cells.
- Surgery to remove the spleen (splenectomy)

Which treatments you get will depend on which phase you are in, your age, your overall health, and other factors. When the signs and symptoms of CML are reduced or have disappeared, it is called remission. The CML may come back after remission, and you may need more treatment.

NIH: National Cancer Institute

Start Here

- Chronic Myelogenous Leukemia [https://www.mayoclinic.org/diseases-conditions/chronic-myelogenous-leukemia/symptoms-causes/syc-20352417?p=1] (Mayo Foundation for Medical Education and Research)
- Chronic Myelogenous Leukemia (CML) [https://www.nmdp.org/patients/understanding-transplant/diseases-treated-by-transplant/chronic-myeloid-leukemia] (National Marrow Donor Program)
- General Information about Chronic Myelogenous Leukemia [https://www.cancer.gov/types/leukemia/patient/cml-treatment-pdq] NIH (National Cancer Institute)
  Also in Spanish [https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lmc-pdq]
- What Is Chronic Myeloid Leukemia? [https://www.cancer.org/cancer/types/chronic-myeloid-leukemia/about/what-is-cml.html] (American Cancer Society)
  Also in Spanish [https://www.cancer.org/es/cancer/tipos/leucemia-mieloide-cronica/acerca/que-es-leucemia-mieloide-cronica.html]

Diagnosis and Tests

- BCR ABL Genetic Test [https://medlineplus.gov/lab-tests/bcr-abl-genetic-test/] NIH (National Library of Medicine)
  Also in Spanish [https://medlineplus.gov/spanish/pruebas-de-laboratorio/prueba-genetica-bcr-abl/]
- Blood Tests [https://www.nhlbi.nih.gov/health/blood-tests] NIH (National Heart, Lung, and Blood Institute)
  Also in Spanish [https://www.nhlbi.nih.gov/es/salud/analisis-de-sangre]
- Can Chronic Myeloid Leukemia Be Found Early? [https://www.cancer.org/cancer/types/chronic-myeloid-leukemia/detection-diagnosis-staging/detection.html] (American Cancer Society)
  Also in Spanish [https://www.cancer.org/es/cancer/tipos/leucemia-mieloide-cronica/deteccion-diagnostico-clasificacion-por-etapas/deteccion.html]
- 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]
- Stages of Chronic Myelogenous Leukemia [https://www.cancer.gov/types/leukemia/patient/cml-treatment-pdq#_31] NIH (National Cancer Institute)
  Also in Spanish [https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lmc-pdq#_96]
- Tests for Chronic Myeloid Leukemia [https://www.cancer.org/cancer/types/chronic-myeloid-leukemia/detection-diagnosis-staging/how-diagnosed.html] (American Cancer Society)
  Also in Spanish [https://www.cancer.org/es/cancer/tipos/leucemia-mieloide-cronica/deteccion-diagnostico-clasificacion-por-etapas/como-se-diagnostica.html]

Prevention and Risk Factors

- Risk Factors for Chronic Myeloid Leukemia [https://www.cancer.org/cancer/types/chronic-myeloid-leukemia/causes-risks-prevention/risk-factors.html] (American Cancer Society)
  Also in Spanish [https://www.cancer.org/es/cancer/tipos/leucemia-mieloide-cronica/causas-riesgos-prevencion/factores-de-riesgo.html]

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] NIH (National Library of Medicine)
  Also in Spanish [https://medlineplus.gov/spanish/bonemarrowtransplantation.html]
- 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]
- Treating Chronic Myeloid Leukemia by Phase [https://www.cancer.org/cancer/types/chronic-myeloid-leukemia/treating/treating-by-phase.html] (American Cancer Society)
  Also in Spanish [https://www.cancer.org/es/cancer/tipos/leucemia-mieloide-cronica/tratamiento/tratamiento-segun-la-etapa.html]
- Treatment Option Overview (Chronic Myelogenous Leukemia) [https://www.cancer.gov/types/leukemia/patient/cml-treatment-pdq#_48] NIH (National Cancer Institute)
  Also in Spanish [https://www.cancer.gov/espanol/tipos/leucemia/paciente/tratamiento-lmc-pdq#_115]

Living With

- Living as a Chronic Myeloid Leukemia Survivor [https://www.cancer.org/cancer/types/chronic-myeloid-leukemia/after-treatment/follow-up.html] (American Cancer Society)
  Also in Spanish [https://www.cancer.org/es/cancer/tipos/leucemia-mieloide-cronica/despues-del-tratamiento/cuidado-de-seguimiento.html]

Specifics

- Atypical Chronic Myelogenous Leukemia [https://www.cancer.gov/types/myeloproliferative/patient/mds-mpd-treatment-pdq#_257] NIH (National Cancer Institute)
  Also in Spanish [https://www.cancer.gov/espanol/tipos/mieloproliferativas/paciente/tratamiento-mds-mpd-pdq#_147]

Genetics

- Chronic myeloid leukemia: MedlinePlus Genetics [https://medlineplus.gov/genetics/condition/chronic-myeloid-leukemia] NIH (National Library of Medicine)
- What Causes Chronic Myeloid Leukemia? [https://www.cancer.org/cancer/types/chronic-myeloid-leukemia/causes-risks-prevention/what-causes.html] (American Cancer Society)
  Also in Spanish [https://www.cancer.org/es/cancer/tipos/leucemia-mieloide-cronica/causas-riesgos-prevencion/que-lo-causa.html]

Statistics and Research

- Cancer Statistics: Chronic Myeloid Leukemia [https://seer.cancer.gov/statfacts/html/cmyl.html] NIH (National Cancer Institute)

Clinical Trials

- ClinicalTrials.gov: Leukemia, Myelogenous, Chronic, BCR-ABL Positive [https://clinicaltrials.gov/search?cond=%22Leukemia,+Myelogenous,+Chronic,+BCR-ABL+Positive%22&aggFilters=status:not%20rec] NIH (National Institutes of Health)
- ClinicalTrials.gov: Leukemia, Myeloid, Chronic, Atypical, BCR-ABL Negative [https://clinicaltrials.gov/search?cond=%22Leukemia,+Myeloid,+Chronic,+Atypical,+BCR-ABL+Negative%22&aggFilters=status:not%20rec] NIH (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: The Coiled Coil and C2 Domains Modulate BCR Localization and BCR-ABL1... [https://www.ncbi.nlm.nih.gov/pubmed/40724843]
- Article: Comparing therapeutic effects across tyrosine kinase inhibitors: Chronic myeloid leukemia outcomes... [https://www.ncbi.nlm.nih.gov/pubmed/40696584]
- Article: Clinical, morphological and genetic characteristics of patients with concurrent presence of... [https://www.ncbi.nlm.nih.gov/pubmed/40681596]
- Chronic Myeloid Leukemia -- see more articles [https://pubmed.ncbi.nlm.nih.gov/?term=%22Leukemia%2C+Myelogenous%2C+Chronic%2C+BCR-

ABL+Positive%22%5Bmajr%3Anoexp%5D+OR+%22Leukemia%2C+Myeloid%2C+Chronic%2C+Atypical%2C+BCR-ABL+Negative%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+]

Find an Expert

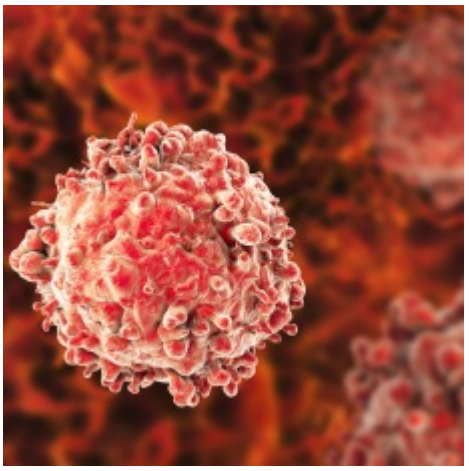
- American Cancer Society [https://www.cancer.org/]
- Choosing a Cancer Doctor [https://www.cancer.org/cancer/managing-cancer/finding-care/where-to-find-cancer-care/choosing-a-cancer-doctor.html] (American Cancer Society)
  Also in Spanish [https://www.cancer.org/es/cancer/como-sobrellevar-el-cancer/encontrar-tratamiento/como-elegir-un-medico-y-un-hospital/como-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

Children

- Childhood Leukemia: MedlinePlus Health Topic [https://medlineplus.gov/childhoodleukemia.html]
  NIH (National Library of Medicine)
  Also in Spanish [https://medlineplus.gov/spanish/childhoodleukemia.html]

Patient Handouts

- After chemotherapy - discharge [https://medlineplus.gov/ency/patientinstructions/000012.htm] (Medical Encyclopedia)
  Also in Spanish [https://medlineplus.gov/spanish/ency/patientinstructions/000012.htm]
- Bone marrow transplant [https://medlineplus.gov/ency/article/003009.htm] (Medical Encyclopedia)
  Also in Spanish [https://medlineplus.gov/spanish/ency/article/003009.htm]
- Bone marrow transplant - discharge [https://medlineplus.gov/ency/patientinstructions/000010.htm] (Medical Encyclopedia)
  Also in Spanish [https://medlineplus.gov/spanish/ency/patientinstructions/000010.htm]
- Chronic myelogenous leukemia (CML) [https://medlineplus.gov/ency/article/000570.htm] (Medical Encyclopedia)
  Also in Spanish [https://medlineplus.gov/spanish/ency/article/000570.htm]



MEDICAL ENCYCLOPEDIA

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

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

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

Fibrinopeptide A blood test [https://medlineplus.gov/ency/article/003373.htm]

Related Health Topics

Acute Lymphocytic Leukemia [https://medlineplus.gov/acutelymphocyticleukemia.html]

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

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

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

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

National Institutes of Health

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