CONDITION

Leukemia

Leukemia is a group of cancers that cause abnormal blood cells to build up.

WHAT IT IS
Cancer of blood-forming tissues causing abnormal blood cells

BODY SYSTEM
Blood, bone marrow, and immune system

MAIN SYMPTOMS
Fatigue, infections, easy bruising, unexplained weight loss

WHAT CAUSES IT
Acquired DNA changes; exact trigger often unknown

HOW IT IS DIAGNOSED
Blood counts, blood smear, and bone marrow tests

MAIN TREATMENT
Chemotherapy, targeted drugs, immunotherapy, sometimes stem cell transplant

CAN IT BE CURED?
Sometimes - type, age, and treatment response matter

IS IT AN EMERGENCY?
Sometimes - fever, severe bleeding, breathlessness, or confusion

LONG-TERM OUTLOOK
Ranges from often curable to long-term controllable

Overview

Leukemia is a group of cancers affecting blood-forming cells, mainly in the bone marrow. Bone marrow is the soft tissue inside certain bones where blood cells are made.

In leukemia, a blood-forming cell develops changes in its DNA, which contains the cell's instructions. The changed cell makes many abnormal cells. These may crowd out healthy red blood cells, white blood cells, and platelets.

There are several types. Their names describe the affected cell and how quickly the condition usually develops:

Lymphocytes are white blood cells involved in immune protection. Myeloid cells produce several other blood cells, including infection-fighting cells, red blood cells, and platelets.

The exact type matters because symptoms, treatment, and outlook differ greatly. Some acute

leukemias can be cured, while some chronic leukemias are controlled for years with monitoring or ongoing treatment.

- Acute lymphoblastic leukemia (ALL) affects immature lymphoid cells and usually progresses quickly
- Acute myeloid leukemia (AML) affects immature myeloid cells and usually progresses quickly
- Chronic lymphocytic leukemia (CLL) affects lymphocytes and often develops slowly
- Chronic myeloid leukemia (CML) affects myeloid cells and often has a slower early phase

Symptoms

Leukemia can cause symptoms when abnormal cells crowd out healthy blood cells. Symptoms may develop over days or weeks with acute leukemia. Chronic leukemia may cause no symptoms at first and may be found during a blood test for another reason.

A shortage of red blood cells, called anemia, may cause tiredness, weakness, pale skin, dizziness, or breathlessness. Low numbers of healthy white blood cells can lead to infections that are frequent, severe, or slow to improve.

Low platelets can cause easy bruising, frequent nosebleeds, bleeding gums, small red or purple skin spots, or bleeding that takes longer to stop. Platelets help blood clot.

Other possible symptoms include:

These symptoms have many possible causes and do not by themselves mean that you have leukemia. Persistent or unexplained symptoms should be assessed rather than self-diagnosed.

- Fever or night sweats
- Unexplained weight loss or reduced appetite
- Bone or joint pain
- Swollen lymph nodes, often in the neck, armpit, or groin
- A feeling of fullness under the ribs from an enlarged spleen or liver

Causes and risk factors

Leukemia begins when blood-forming cells acquire DNA changes. These changes affect how cells grow, mature, and die. Why this happens is often unknown.

Most leukemia is not directly inherited from a parent. However, certain inherited conditions can increase risk. These include Down syndrome and some uncommon conditions affecting DNA repair or bone marrow function.

Other established risk factors differ by leukemia type. They can include older age, previous treatment with certain chemotherapy medicines, high-dose radiation exposure, and long-term exposure to benzene. Smoking increases the risk of AML.

CML cells contain a genetic change called the Philadelphia chromosome. This creates an abnormal gene known as BCR::ABL1 , which tells cells to keep growing. The change develops during life and is not usually passed to children.

Having a risk factor does not mean you will develop leukemia. Many people with leukemia have no clear risk factor, and most people with known risk factors never develop it.

Diagnosis

A complete blood count measures red blood cells, white blood cells, and platelets. It may show abnormal numbers or immature cells, but a blood count alone does not always confirm leukemia.

A blood smear allows a laboratory specialist to examine the cells under a microscope. If leukemia is suspected, bone marrow testing is often needed. During bone marrow aspiration and biopsy, a clinician removes liquid marrow and a small piece of tissue, usually from the back of the hip bone.

Laboratory tests then identify the exact cells involved. Flow cytometry looks for proteins on or inside cells. Chromosome and molecular tests look for genetic changes that help classify the leukemia and guide treatment.

Some people need other tests. A lumbar puncture may be used to check the fluid around the brain and spinal cord, particularly with ALL. Imaging can assess enlarged organs or other concerns, but scans do not usually confirm leukemia.

The diagnosis includes more than the name of the leukemia. Cell features, genetic changes, overall health, age, and whether the condition has affected other areas all help shape the treatment plan.

Treatment and management

Treatment is chosen for the specific leukemia. It may involve a team with expertise in blood

cancers. Second opinions and clinical trials may also be considered, especially when there are several reasonable options.

Acute leukemias usually require prompt treatment. Chemotherapy uses medicines that destroy rapidly dividing cells. Treatment for ALL often has several phases and includes therapy to prevent or treat leukemia in the brain and spinal cord. AML treatment may use intensive chemotherapy or less intensive approaches, depending on the leukemia and the person's health.

Acute promyelocytic leukemia, a form of AML, requires particularly prompt specialist care because it can disrupt blood clotting. It is treated differently from most other AML types.

Targeted drugs act on specific changes within leukemia cells. For example, medicines that block BCR::ABL1 are central to CML treatment. Other targeted treatments may be used for AML, ALL, or CLL when testing finds a relevant marker.

Immunotherapy helps the immune system recognize or attack leukemia cells. It includes antibody treatments and, in selected cases, CAR T-cell therapy, in which a person's immune cells are modified in a laboratory.

Some people may have a stem cell transplant. This uses blood-forming stem cells from a donor after treatment intended to remove leukemia cells. It can offer a chance of long-term remission or cure, but it has significant risks and is not suitable or necessary for everyone.

CLL may not need immediate treatment when it is causing no symptoms or harmful blood-count changes. Regular monitoring without treatment is called active surveillance or "watch and wait." Treatment begins if the CLL becomes active based on specific clinical findings.

Supportive care is important at every stage. It may include blood or platelet transfusions, infection treatment, medicines to reduce nausea, and steps to prevent tumor lysis syndrome. Tumor lysis syndrome is a potentially serious chemical imbalance caused when many cancer cells break down quickly.

Before treatment, you may be offered advice about fertility preservation, vaccinations, dental care, work, and practical support.

Complications

Leukemia and its treatment can reduce healthy blood cells. This may lead to anemia, infection, or bleeding. Very high numbers of leukemia cells can occasionally interfere with blood flow, causing breathing or neurological symptoms.

Treatment can also cause tumor lysis syndrome. Stem cell transplantation may cause graft-versus-host disease, in which donor immune cells attack the recipient's tissues.

Long-term effects depend on the treatment received. They may include fertility problems, heart or other organ effects, and a higher chance of another cancer. These effects are not inevitable. Follow-up is planned around each person's treatment history and risks.

Leukemia can sometimes return after remission. This is called relapse. Further treatment may still be possible and can differ from the first treatment.

Prevention

Most cases of leukemia cannot be prevented because the DNA changes usually occur without a known avoidable cause. There is no routine screening test recommended for people without symptoms or a specific high-risk condition.

Not smoking can reduce the risk of AML and has many other health benefits. Workplace safety measures can limit benzene exposure. However, developing leukemia does not mean that you caused it through your choices.

People with certain inherited conditions or a history of treatment that increases leukemia risk may receive individual follow-up. This is monitoring rather than guaranteed prevention.

Living with it and what to expect

The course of leukemia differs greatly by type. Acute leukemia often involves intensive treatment and frequent appointments over months. Some treatment plans continue for longer. Chronic leukemia may be monitored or treated over many years.

Remission means that signs of leukemia have reduced or disappeared after treatment. It is not always the same as cure. Sensitive tests may look for measurable residual disease, meaning very small numbers of leukemia cells that ordinary microscope tests cannot detect.

Follow-up commonly includes examinations and blood tests. Bone marrow or molecular tests may also be needed. Early follow-up may be frequent and usually becomes less frequent when the condition remains stable, although long-term schedules differ.

Some people return to most usual activities after treatment. Others have lasting fatigue, infection concerns, emotional stress, or changes in work and family life. Energy may improve gradually rather than all at once.

People living with chronic leukemia may have long periods when daily life changes little.

Treatment side effects and monitoring can still affect routines. Psychological support, rehabilitation, financial advice, and support groups can help with the practical and emotional effects of living with cancer.

When to get medical help

Arrange a routine medical appointment if you have persistent, unexplained symptoms such as unusual tiredness, repeated infections, easy bruising, swollen lymph nodes, night sweats, or weight loss. These symptoms are more often caused by conditions other than leukemia, but they deserve assessment if they continue.

If you have leukemia or are receiving treatment, follow the urgent-contact instructions from your treatment team. Contact them promptly about a fever, new infection symptoms, unexpected bleeding, worsening weakness, or side effects that prevent you from drinking or taking medicines.

Seek emergency help for:

A fever during treatment can be urgent because chemotherapy may weaken infection-fighting cells. Do not wait for a routine appointment if your treatment team has told you to report a particular temperature or symptom immediately.

- Severe difficulty breathing or new chest pain
- Heavy bleeding that does not stop
- Sudden confusion, fainting, seizure, or new weakness
- A severe headache with neurological changes
- Rapidly worsening illness during cancer treatment

Common questions

Is leukemia curable?

Sometimes. Cure is possible for some acute leukemias, particularly when treatment produces a deep and lasting remission. Some chronic leukemias are more often controlled than cured. The type, genetic findings, age, overall health, and response to treatment all matter.

Can a routine blood test find leukemia?

A routine blood count may reveal abnormal cells or unusual cell numbers. This can lead to further investigation, but it does not always establish the diagnosis. Blood-cell testing and

often a bone marrow test are needed to confirm and classify leukemia.

Is leukemia inherited?

Most leukemia is not inherited and usually is not passed from parent to child. A small number of inherited conditions increase risk, but the genetic changes found within leukemia cells usually developed during the person's lifetime.

What are the first signs of leukemia?

There is no single first sign. Possible early symptoms include fatigue, repeated infections, fever, easy bruising, bleeding, or unexplained weight loss. Chronic leukemia may cause no early symptoms.

Does leukemia spread like other cancers?

Leukemia starts in blood-forming tissue and abnormal cells can circulate in the blood from an early stage. It is therefore not usually described using the same tumor stages as many solid cancers. Cells may collect in lymph nodes, the spleen, liver, or other tissues.

Is leukemia contagious?

No. You cannot catch leukemia through touch, shared food, blood contact, sex, or being near someone who has it.

Sources

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