All About Leukemia

What is leukemia?

Leukemia is a cancer of the blood or blood cells. There are a few types of leukemia. These types are classified by how quickly they progress and which cells they affect. In order to understand how leukemia affects the cells, it is helpful to first understand what normal blood cells do.

- **White blood cells** (also called leukocytes) are cells that fight infections in the body. There are several different types of white blood cells.
- **Red blood cells** (also called erythrocytes) give blood its red color. More importantly, they carry oxygen from the lungs to the rest of the body and return carbon dioxide to the lungs as waste.
- **Platelets** (also called thrombocytes) help the body form blood clots to control bleeding.
- In addition to these three cell types, the blood also contains fluid called **plasma**. Plasma is clear to yellow in color and is made up of water, salt, enzymes, and proteins. It makes up the largest portion of blood.

All of these cells are made in the bone marrow. Bone marrow is a spongy area located in the center of bones. Larger bones have more bone marrow. Therefore, they produce more cells. The larger bones include the femur (top part of the leg or thigh), the hip bones, and parts of the rib cage. The bone marrow contains a small number of cells that are in development and are not yet mature. These cells are called blasts. Once the cell has matured, it moves out of the bone marrow and into the circulating blood. The body has ways to know when more cells are needed and has the ability to produce them when needed.

In the case of leukemia, one blood cell does not work as it should (in most cases, this cell is a white blood cell). The body then makes large numbers of this cell. When looked at under a microscope, these abnormally made cells look different than the healthy cells and do not work properly. The body continues to make these abnormal, non-working cells, leaving little space for healthy cells. This imbalance of healthy and unhealthy cells is what causes the symptoms of leukemia.

What are the types of leukemia?

Leukemia is classified as either acute or chronic. This refers to how quickly the disease develops and progresses.

- In **acute leukemia**, the white blood cells multiply very quickly and are very immature. They do not work properly (remember, immature cells are called blasts). The blood fills with blasts quickly, causing you to develop symptoms and seek medical attention.
- In **chronic leukemia**, the blasts form more slowly, allowing the body to continue to produce cells that work. You will have fewer symptoms. Chronic leukemia is often diagnosed incidentally (by chance) during a routine physical or blood work. Chronic leukemia may cause the spleen to become enlarged. A healthcare provider can feel this during a physical exam. This will prompt further testing.

The types of leukemia are further divided by the type of white blood cell that is affected: lymphoid cells or myeloid cells. These types are called lymphocytic leukemia and myelogenous leukemia.

The general classifications of leukemia are:

- **Acute myeloid leukemia (also called AML)** - Occurs in both children and adults.
- **Acute lymphocytic leukemia (ALL)** - The most common type seen in children, but also seen in adults, most often over 65.
- **Chronic myelogenous leukemia (CML)** - Occurs mostly in adults, young and old.
- **Chronic lymphocytic leukemia (CLL)** - Most often seen in people over age 55, can affect younger adults, but almost never
seen in children.

With each of these classifications of leukemia, there are several subtypes (discussed further in each article listed above) that may help choose treatment plans.

**What causes leukemia and am I at risk?**

Every year about 60,530 new cases of leukemia are diagnosed. Leukemia affects people of all ages; but the average age of diagnosis in adult leukemias is 67. Acute leukemia is more common than chronic leukemia. In adults, the most common types are AML and CLL. In children and adolescents, ALL is the most common type of leukemia. Leukemia tends to be more common in non-Hispanic whites. The lowest frequency of leukemia diagnosis occurs amongst Asian, Pacific Islander, American Indian and Alaska Native populations. Leukemia occurs more often in men than women regardless of race/ethnicity.

We do not know what causes most cases of leukemia. There are a few factors that may increase your risk of being diagnosed with leukemia. These include:

- Exposure to high-energy radiation, like that from a nuclear accident or bomb.
- Some genetic syndromes, such as Down's syndrome, may put a person at higher risk.
- Exposure to the chemical benzene.
- Prior treatment with certain types of chemotherapy.
- Having a personal history of certain blood disorders, such as myelodysplastic syndrome (MDS).
- Smoking cigarettes increases the risk of acute myelogenous leukemia (AML) because it is a source of exposure to benzene.

It is important to realize that many patients with leukemia do not have any identifiable risk factors.

**How can I prevent leukemia?**

Because we do not know the exact cause, it is not possible to recommend ways to prevent leukemia. If possible, avoid smoking, exposure to radiation, and the chemical benzene.

**What screening tests are used for leukemia?**

Because leukemia is a rare disease, healthcare providers do not routinely screen for it. Many cases are found incidentally during a routine physical examination with a healthcare provider when a complete blood count (CBC) is performed.

**What are the signs of leukemia?**

*Acute leukemia* tends to cause symptoms rapidly, triggering the individual to seek medical attention. These include:

- Fever.
- Chills.
- Weakness and fatigue.
- Night sweats
- Weight loss.
- Headaches.
- Vomiting.
- Confusion.
- Seizures.

Symptoms can also be associated with changes in how the blood cells function. The blast cells are unable to perform their normal function of fighting infection, so patients may develop fevers or infections that won't go away. As the number of immature cells (blasts) increases, the normal cells are crowded out. This leads to low red blood cell counts and low platelet counts. A low red cell count is called anemia, which may cause the patient to feel tired or appear pale. A low platelet count affects blood clotting, causing the patient to bleed or bruise easily.
In chronic leukemia, symptoms may not appear for some time. When they first appear, they may be mild. Enlarged lymph nodes, liver or spleen may occur in chronic leukemia. As mentioned previously, chronic leukemia is often found during routine examinations with your healthcare provider.

**How is leukemia diagnosed?**

Your healthcare provider will ask about medical history and will perform a physical exam. During the exam, changes such as enlarged spleen, liver or lymph nodes may be felt, prompting further testing. A blood test called a complete blood count may find blast cells in the blood sample, suggesting leukemia. This test can reveal that the patient has leukemia, but further testing is required to determine the type.

To determine the type of leukemia, the healthcare provider performs a bone marrow biopsy. During this procedure, a sample of bone marrow is taken. This is done by placing a needle into a bone (usually the hip bone) and removing a sample of the marrow. These cells are looked at under a microscope, allowing the healthcare provider to determine what cell is abnormal, and whether it is an acute or chronic leukemia. A lumbar puncture (spinal tap) may be done to determine if leukemia cells have entered the nervous system. This decision depends on the type of leukemia and your symptoms.

**How is leukemia treated?**

Treatment depends on the type of leukemia, as well as your age, health status and extent of the disease. You can read more about specific treatments for each type of leukemia in the linked articles below. Due to the relative rarity of the disease, it is recommended that you receive treatment at a medical center that is experienced in treating the disease. Acute leukemias need to be treated quickly. The goal of therapy is to put you into remission. This means there is no evidence of leukemic cells, and the body returns to normal. Once this is achieved, patients often receive further therapy to prevent a relapse (return of the disease), which is called consolidation therapy.

Chronic leukemias may not need to be treated right away, depending on the symptoms at diagnosis. It has been thought in the past that chronic leukemias could never be cured, but control of chronic leukemia is possible given the development of new therapies.

**Clinical Trials**

There are clinical research trials for most types of cancer, and every stage of the disease. Clinical trials are designed to determine the value of specific treatments. Trials are often designed to treat a certain stage of cancer, either as the first form of treatment offered, or as an option for treatment after other treatments have failed to work. They can be used to evaluate medications or treatments to prevent cancer, detect it earlier, or help manage side effects. Clinical trials are extremely important in furthering our knowledge of disease. It is through clinical trials that we know what we do today, and many exciting new therapies are currently being tested. Talk to your provider about participating in clinical trials in your area. You can also explore currently open clinical trials using the OncoLink Clinical Trials Matching Service.

**Follow-up care and Survivorship**

Patients with acute leukemia are followed closely, with frequent monitoring of blood cell counts, to watch for relapse, after therapy has induced a remission. Patients who have a remission that lasts five years are generally considered cured. In chronic leukemia, blood counts may be monitored for years, with or without treatment, depending on the case.

Fear of recurrence, relationships and sexual health, the financial impact of cancer treatment, employment issues, and coping strategies are common emotional and practical issues experienced by leukemia survivors. Your healthcare team can identify resources for support and management of these challenges faced during and after cancer.

Cancer survivorship is a relatively new focus of oncology care. With almost 17 million cancer survivors in the US alone, there is a need to help patients transition from active treatment to survivorship. What happens next, how do you get back to normal, what should you know and do to live healthy going forward? A survivorship care plan can be a first step in educating yourself about navigating life after cancer and helping you communicate knowledgeably with your healthcare providers. Create a survivorship care plan today on OncoLink.
Resources for More Information

OncoLink Articles on Types of Leukemia

- Acute myeloid leukemia (AML).
- Acute lymphocytic leukemia (ALL).
- Chronic myelogenous leukemia (CML).
- Chronic lymphocytic leukemia (CLL).

The Leukemia & Lymphoma Society

The Leukemia and Lymphoma Society provides patient education, support and financial resources for individuals with blood cancers.

National Cancer Institute

The National Cancer Institute is the US government information clearinghouse for cancer information.

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