About Chronic Lymphocytic Leukemia
Overview and Types

If you have been diagnosed with chronic lymphocytic leukemia or worried about it, you likely have a lot of questions. Learning some basics is a good place to start.

- What Is Chronic Lymphocytic Leukemia?

Research and Statistics

See the latest estimates for new cases of chronic lymphocytic leukemia and deaths in the US and what research is currently being done.

- What Are the Key Statistics for Chronic Lymphocytic Leukemia?
- What's New in Chronic Lymphocytic Leukemia Research and Treatment?

What Is Chronic Lymphocytic Leukemia?

Cancer starts when cells in the body begin to grow out of control. Cells in nearly any part of the body can become cancer, and can spread to other areas of the body. To learn more about how cancers start and spread, see What Is Cancer?

Chronic lymphocytic leukemia (CLL) is a type of cancer that starts from cells that become certain white blood cells (called lymphocytes) in the bone marrow. The cancer (leukemia) cells start in the bone marrow but then go into the blood.

In CLL, the leukemia cells often build up slowly over time, and many people don't have any symptoms for at least a few years. In time, the cells can spread to other parts of the body, including the lymph nodes, liver, and spleen.
What is leukemia?

Leukemia is a cancer that starts in the blood-forming cells of the bone marrow. When one of these cells changes and becomes a leukemia cell, it no longer matures normally. Often, it divides to make new cells faster than normal. Leukemia cells also don't die when they should. This allows them to build up in the bone marrow, crowding out normal cells. At some point, leukemia cells leave the bone marrow and spill into the bloodstream, often causing the number of white blood cells in the blood to increase. Once in the blood, leukemia cells can spread to other organs, where they can prevent other cells in the body from functioning normally.

Leukemia is different from other types of cancer that start in organs like the lungs, colon, or breast and then spread to the bone marrow. Cancers that start elsewhere and then spread to the bone marrow are not leukemia.

Not all leukemias are the same. Knowing the specific type of leukemia helps doctors better predict each patient’s prognosis (outlook) and select the best treatment.

What is a chronic leukemia?

Whether leukemia is acute or chronic depends on whether most of the abnormal cells are immature (and are more like stem cells) or mature (and are like normal white blood cells).

In chronic leukemia, the cells can mature partly but not completely. These cells may look fairly normal, but they are not. They generally do not fight infection as well as normal white blood cells do. The leukemia cells survive longer than normal cells, and build up, crowding out normal cells in the bone marrow. Chronic leukemias can take a long time before they cause problems, and most people can live for many years. But chronic leukemias are generally harder to cure than acute leukemias.

What is a lymphocytic leukemia?

Whether leukemia is myeloid or lymphocytic depends on which bone marrow cells the cancer starts in.

Lymphocytic leukemias (also known as lymphoid or lymphoblastic leukemia) start in the cells that become lymphocytes. Lymphomas are also cancers that start in those cells. The main difference between lymphocytic leukemias and lymphomas is that in
leukemia, the cancer cell is mainly in the bone marrow and blood, while in lymphoma it tends to be in lymph nodes and other tissues.

**Are there different types of CLL?**

Doctors have found that there seem to be 2 different kinds of CLL:

- One kind of CLL grows very slowly and so it may take a long time before the patient needs treatment.
- The other kind of CLL grows faster and is a more serious disease.

The leukemia cells from these 2 types look alike, but lab tests can tell the difference between them. The tests look for proteins called ZAP-70 and CD38. If the CLL cells contain low amounts of these proteins, the leukemia tends to grow more slowly.

**What are the other types of leukemia?**

There are 4 main types of leukemia based on whether they are acute or chronic, and myeloid or lymphocytic:

- **Acute myeloid (or myelogenous) leukemia** (AML)
- **Chronic myeloid (or myelogenous) leukemia** (CML)
- **Acute lymphocytic (or lymphoblastic) leukemia** (ALL)
- Chronic lymphocytic leukemia (CLL)

In *acute* leukemias, the bone marrow cells cannot mature properly. Immature leukemia cells continue to reproduce and build up. Without treatment, most people with acute leukemia would live only a few months. Some types of acute leukemia respond well to treatment, and many patients can be cured. Other types of acute leukemia have a less favorable outlook.

*Myeloid* leukemias (also known as myelocytic, myelogenous, or non-lymphocytic leukemias) start in early forms of myeloid cells -- white blood cells (other than lymphocytes), red blood cells, or platelet-making cells (megakaryocytes).

**Rarer forms of lymphocytic leukemia**

The common form of CLL starts in B lymphocytes, but there are some rare types of leukemia that share some features with CLL.
Prolymphocytic leukemia (PLL): In this type of leukemia the cancer cells are similar to normal cells called prolymphocytes -- immature forms of B lymphocytes (B-PLL) or T lymphocytes (T-PLL). Both B-PLL and T-PLL tend to be more aggressive than the usual type of CLL. Most people will respond to some form of treatment, but over time they tend to relapse. PLL may develop in someone who already has CLL (in which case it tends to be more aggressive), but it can also occur in people who have never had CLL.

Large granular lymphocyte (LGL) leukemia: This is another rare form of chronic leukemia. The cancer cells are large and have features of either T lymphocytes or another type of lymphocyte called natural killer (NK) cells. Most LGL leukemias are slow-growing, but a small number are more aggressive. Drugs that suppress the immune system may be helpful, but aggressive cases are very hard to treat.

Hairy cell leukemia (HCL): This is another cancer of lymphocytes that tends to progress slowly. It accounts for about 2% of all leukemias. The cancer cells are a type of B lymphocyte but are different from those seen in CLL. There are also important differences in symptoms and treatment. This type of leukemia gets its name from the way the cells look under the microscope -- they have fine projections on their surface that make them look "hairy." Treatment for HCL can be very effective and is described in How is Chronic Lymphocytic Leukemia Treated?

The rest of this document focuses mainly on CLL in adults, with some limited information on hairy cell leukemia. For information on other types of leukemia in adults and children, please see our separate documents on these topics.

- References

See all references for Chronic Lymphocytic Leukemia

Last Medical Review: January 6, 2015 Last Revised: April 11, 2016

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Normal Bone Marrow, Blood, and Lymphoid Tissue

Different types of leukemia are formed from different types of cells. To understand the
different types of leukemia, it helps to know some basic facts about the blood and lymph systems.

**Bone marrow**

Bone marrow is the soft inner part of some bones such as the skull, shoulder blades, ribs, pelvis, and backbones. Bone marrow is made up of a small number of blood stem cells, more mature blood-forming cells, fat cells, and supporting tissues that help cells grow.

Inside the bone marrow, blood stem cells develop into new blood cells. During this process, the cells become either lymphocytes (a kind of white blood cell) or other blood-forming cells. These blood-forming cells can develop red blood cells, white blood cells (other than lymphocytes), or platelets.

**Types of blood cells**

**Red blood cells** carry oxygen from the lungs to all other tissues in the body, and take carbon dioxide back to the lungs to be removed. Having too few red blood cells in the body (*anemia*) can make you feel tired, weak, and short of breath because your body tissues are not getting enough oxygen.

**Platelets** are actually cell fragments made by a type of bone marrow cell called the *megakaryocyte*. Platelets are important in plugging up holes in blood vessels caused by cuts or bruises. Having too few platelets (*thrombocytopenia*) may cause you to bleed or bruise easily.

**White blood cells** help the body fight infections. Having too few white blood cells (*neutropenia*) lowers your immune system and can make you more likely to get an infection.

**Types of white blood cells**

**Lymphocytes** are mature, infection-fighting cells that develop from *lymphoblasts*, a type of blood stem cell in the bone marrow. Lymphocytes are the main cells that make up lymphoid tissue, a major part of the immune system. Lymphoid tissue is found in lymph nodes, the thymus gland, the spleen, the tonsils and adenoids, and is scattered throughout the digestive and respiratory systems and the bone marrow. There are 2 main types of lymphocytes:
• B lymphocytes (B cells) protect the body from invading germs by developing (maturing) into plasma cells, which make proteins called antibodies. The antibodies attach to the germs (bacteria, viruses, and fungi), which helps other white blood cells called granulocytes to recognize and destroy them. B lymphocytes are the cells that most often develop into chronic lymphocytic leukemia (CLL) cells.

• T lymphocytes (T cells) can recognize cells infected by viruses and directly destroy these cells. They also help regulate the immune system.

Granulocytes are mature, infection-fighting cells that develop from myeloblasts, a type of blood forming cell in the bone marrow. Granulocytes have granules that show up as spots under the microscope. These granules contain enzymes and other substances that can destroy germs, such as bacteria. The 3 types of granulocytes -- neutrophils, basophils, and eosinophils -- are distinguished under the microscope by the size and color of their granules.

Monocytes develop from blood-forming monoblasts in the bone marrow and are related to granulocytes. After circulating in the bloodstream for about a day, monocytes enter body tissues to become macrophages, which can destroy some germs by surrounding and digesting them. Macrophages also help lymphocytes recognize germs and start making antibodies to fight them.

• References
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What Are the Key Statistics for Chronic Lymphocytic Leukemia?

The American Cancer Society's estimates for leukemia in the United States for 2017 are:

• About 62,130 new cases of leukemia and about 24,500 deaths from leukemia (all kinds)
• About 20,110 new cases of chronic lymphocytic leukemia (CLL)
• About 4,660 deaths from CLL

CLL accounts for about one-quarter of the new cases of leukemia. The average person's lifetime risk of getting CLL is about ½ of 1% (about 1 in 200). The risk is slightly higher in men than in women.

CLL mainly affects older adults. The average age at the time of diagnosis is around 71 years. It is rarely seen in people under age 40, and is extremely rare in children.

Visit the American Cancer Society's Cancer Statistics Center for more key statistics.

• References
See all references for Chronic Lymphocytic Leukemia

What's New in Chronic Lymphocytic Leukemia Research and Treatment?

Many studies of chronic lymphocytic leukemia (CLL) are being done in labs and in clinical trials around the world.

Genetics of chronic lymphocytic leukemia

Scientists are making great progress in understanding how changes in a person's DNA can cause normal bone marrow cells to develop into leukemia cells. Learning about changes in the genes (regions of the DNA) that often occur in CLL is providing insight into why these cells grow too quickly, live too long, and fail to develop into normal blood cells. Doctors are also learning how to use these changes to help them determine a person's outlook and whether they will need treatment.

New drugs for chronic lymphocytic leukemia
Dozens of new drugs are being tested for use against CLL. Many of these drugs are targeted at specific parts of cancer cells, while others are more like standard chemotherapy drugs.

Oblimersen (Genasense®) is a drug that has been studied for use in CLL. In studies, giving this drug along with chemo was more likely than chemo alone to cause the CLL to go into remission and stay there.

A number of new monoclonal antibodies (man-made versions of immune system proteins) are now being studied for use in CLL treatment. Lumiliximab is an antibody used to try to prompt the immune system to attack leukemia cells.

Other antibodies are attached to substances that can poison cancer cells, and are known as immunotoxins. They act as homing devices to deliver the toxins directly to the cancer cells. An immunotoxin known as BL22 has shown a great deal of promise in treating hairy cell leukemia (HCL) in clinical trials. A newer version of this drug, known as HA22 (CAT-8015) is now being tested for use against CLL.

Lenalidomide (Revlimid) is a drug approved to treat multiple myeloma and a certain kind of lymphoma. In studies, it has also shows promise in the treatment of CLL.

- References
See all references for Chronic Lymphocytic Leukemia

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