

Acute Lymphocytic Leukemia Risk Factor Information

This document gives a general overview of risk factors. The document covers:

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- About Acute Lymphocytic Leukemia
- Types of Leukemia
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About Cancer and Risk Factors

Cancer is not just one disease.

Cancer is a group of over 100 different diseases. Cancer occurs when abnormal cells grow out of control and crowd out the normal cells. It can start anywhere in the body and can spread (“metastasize”) to other parts of the body. Cancer types are named for the original location in the body and the type of cell or tissue. Different types of cancer have different causes and risk factors.

Cancer can take a long time to develop.

The cause of cancer is sometimes related to events that happened many years ago. Most cancer types are thought to take anywhere from 10 to over 50 years to develop. A few types, such as leukemia or lymphoma, are thought to take less than 10 years.

A risk factor is anything that increases your chance of getting cancer.

Some risk factors can be controlled while others cannot. Risk factors can include:

- Hereditary conditions (e.g., genes passed down from parents)
- Medical conditions or treatments (e.g., a previous cancer diagnosis)
- Infections (e.g., human papilloma virus)
- Lifestyle factors (e.g., smoking cigarettes)
- Environmental exposures (e.g., certain air pollutants)

Most risk factors do not directly cause cancer.

A risk factor influences the development of cancer but usually does not directly cause cancer. Instead, a combination of risk factors likely drives cancer development. For example, genetic factors can make individuals more likely to get cancer when they are exposed to a cancer-causing chemical.

Environmental risk factors depend on how, how much, and how long you are exposed.

Your risk from exposure to certain chemicals or radiation depends on the type, extent, and duration of exposure. For example, inhaling a certain chemical may increase your risk of getting cancer. However, touching the same chemical may not. In addition, some substances may increase your risk only if you are exposed to high amounts over a long time.

It is difficult to identify the exact causes of cancer.

- Many cancers can develop due to random chance.
- Multiple risk factors can act in combination.
- Risk factors can change over time.
- Cancer might not develop or get diagnosed for a long time after an initiating event (such as exposure or random cell mutation).

Knowing your risk factors can help you make more informed choices.

Discuss your risk factors with your health care provider to make more informed decisions on lifestyle and health care.

About Acute Lymphocytic Leukemia (ALL)

The average person's chance of getting ALL in their life is about 1 in 1,000.

The American Cancer Society estimates that 60,650 individuals will be diagnosed with leukemia in the United States in 2022. About 6,660 will be diagnosed with ALL specifically.^{1,3} In Massachusetts, leukemia accounted for about 2.6% of all cancers diagnosed between 2013 and 2017.⁸

Most diagnoses of acute lymphocytic leukemia occur in children.

The risk for developing ALL is highest in children younger than 5 years of age, peaking between ages 2 and 5 years.^{1,4,7} The risk then declines slowly until the mid-20s and begins to slowly rise again after age 50.^{1,7} About 4 out of every 10 diagnoses of ALL occur in adults. ALL is more common among whites than blacks and slightly more common among males than females.¹

Leukemia is the most common type of childhood cancer.

Leukemia makes up nearly 1 out of every 3 childhood cancers. ALL makes up about 3 out of every 4 diagnoses of leukemia among children and teens. However, childhood leukemia is still a rare disease overall.^{4,9}

Types of Leukemia

Leukemia is a cancer of the bone marrow and blood.

Leukemia types are grouped according to the type of blood cell affected and how fast the disease progresses.

- “Lymphocytic” leukemias start in early forms of white blood cells called lymphocytes.
- “Myeloid” (or myelogenous) leukemias start from myeloid cells that normally form red blood cells, platelets, or white blood cells other than lymphocytes.
- “Acute” leukemias progress faster than “chronic” leukemias. Acute and chronic forms of leukemia have different approaches to diagnosis and treatment.¹

There are 4 main groups of leukemia:

- Acute myeloid leukemia (AML) - about 33%
- Chronic lymphocytic leukemia (CLL) - about 33%
- Chronic myeloid leukemia (CML) - about 15%
- Acute lymphocytic leukemia (ALL) - about 11%³

There are also a few rare types, such as hairy cell leukemia, that make up the remaining 8% of leukemia diagnoses.²

Known Risk Factors

There are only a handful of known risk factors for ALL. Many individuals diagnosed with ALL have few or no known risk factors.

Hereditary Conditions

Having an identical twin with ALL:

Individuals with an identical twin who develops ALL in the first year of life have an increased risk of also getting ALL.¹

Infections

Human T-cell lymphoma/leukemia virus-1 (HTLV-1) infection:

Infection with the human T-cell lymphoma/leukemia virus-1 (HTLV-1) can cause a rare type of ALL. However, this is rare in the United States. Most occur in Japan and the Caribbean.¹

Environmental Exposures

Ionizing radiation:

Exposure to high-level ionizing radiation (e.g., survivors of atomic bombs or nuclear reactor accidents) is associated with the development of ALL.^{1,7}

Previous radiation treatment for another cancer:

Radiation therapy as treatment for another cancer raises a person's risk of developing ALL.¹

Possible Risk Factors

Hereditary Conditions

Certain genetic syndromes:

Certain genetic syndromes and conditions (some of which can be inherited from a parent) appear to increase the risk of developing ALL, including: ^{1,7}

- Down syndrome
- Li-Fraumeni syndrome
- Klinefelter syndrome
- Fanconi anemia
- Bloom syndrome
- Ataxia-telangiectasia
- Neurofibromatosis
- Wiskott-Aldrich syndrome

Infections

Epstein-Barr virus:

The Epstein-Barr virus causes infectious mononucleosis (referred to as "mono"). Occasionally, a form of ALL may be associated with a previous infection of the Epstein-Barr virus.^{1,7} Whereas mono is a very common disease, ALL is uncommon.

Environmental Exposures

Exposure to lower levels of radiation:

Exposure to lower levels of radiation from medical imaging tests, especially very early in life, may increase the risk of leukemia, but this is unclear. Any risk would likely be small. To be

safe, doctors try to limit radiation exposure from these tests as much as possible, especially in children and pregnant women.¹

Certain chemotherapy drugs and certain chemicals:

The risk of ALL may be increased by exposure to certain chemicals, including benzene and some chemotherapy drugs. Benzene is used in the rubber industry, oil refineries, chemical plants, shoe manufacturing, and gasoline-related industries. It is also found in cigarette smoke, as well as some cleaning products, detergents, art supplies, and paint strippers.¹

Other Risk Factors That Have Been Investigated

Environmental Exposures

Electromagnetic fields, cigarette smoke, or chemicals?

Some studies investigated a possible link between ALL and exposure to electromagnetic fields (e.g., living near power lines), smoking, hair dyes, and workplace exposure to diesel, gasoline, pesticides, and certain other chemicals and solvents. To date, there is no strong evidence to link these environmental factors to ALL.^{1,5,6}

References / More Information

This information sheet should not be considered exhaustive. For more information on other possible risk factors and health effects being researched, please see the resources below. Much of the information contained in this summary has been taken directly from these sources. This material is provided for informational purposes only and should not be considered as medical advice. Consult your physician if you have questions regarding a specific medical problem or condition.

American Cancer Society (ACS). <http://www.cancer.org>

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2. ACS. 2018. Chronic Lymphocytic Leukemia (CLL).
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4. ACS. 2020. Leukemia in Children.
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9. NCI. 2019. Childhood Acute Lymphoblastic Leukemia Treatment (PDQ®)—Patient Version.

