



Acute Lymphocytic Leukemia (ALL) Causes, Risk Factors, and Prevention

Risk Factors

A risk factor is anything that affects your chance of getting a disease such as cancer. Learn more about the risk factors for acute lymphocytic leukemia.

- [What Are the Risk Factors for Acute Lymphocytic Leukemia?](#)
- [Do We Know What Causes Acute Lymphocytic Leukemia?](#)

Prevention

There is no known way to prevent most cases of leukemia at this time. Most people who get acute lymphocytic leukemia have no known risk factors, so there is no way to prevent these leukemias from developing.

What Are the Risk Factors for Acute Lymphocytic Leukemia?

A risk factor is something that affects your chance of getting a disease such as cancer. Some risk factors, like smoking, can be controlled. Others, like a person's age or family history, can't be changed.

But risk factors don't tell us everything. Having a risk factor, or even several risk factors, does not mean that you will definitely get the disease. And many people who get the disease may have few or no known risk factors. Even if a person has one or more risk factors and develops cancer, it is often very hard to know how much they might have contributed to the cancer.

There are only a few known risk factors for acute lymphocytic leukemia (ALL).

Radiation exposure

Being exposed to high levels of [radiation](#) is a risk factor for both ALL and [acute myeloid leukemia](#) (AML). Japanese atomic bomb survivors had a greatly increased risk of developing acute leukemia, usually within 6 to 8 years after exposure.

Treating cancer with radiation therapy also increases the risk of leukemia, although AML is more often seen than ALL. The risk seems to be higher if chemotherapy and radiation are both used in treatment.

The possible risks of leukemia from being exposed to lower levels of radiation, such as from medical imaging tests (such as x-rays) are not well-known. Exposure of a fetus to radiation within the first months of development may carry an increased risk of leukemia, but the extent of the risk is not clear.

If there is an increased risk from lower levels of radiation it is likely to be small, but to be safe, most doctors try to limit a person's exposure to radiation as much as possible.

Certain chemical exposures

The risk of ALL may be increased by exposure to certain chemotherapy drugs and certain chemicals, including [benzene](#). Benzene is a solvent used in the rubber industry, oil refineries, chemical plants, shoe manufacturing, and gasoline-related industries, and is also present in cigarette smoke, as well as some glues, cleaning products, detergents, art supplies, and paint strippers. Chemical exposure is more strongly linked to an increased risk of AML than to ALL.

Certain viral infections

Infection with the human T-cell lymphoma/leukemia virus-1 (HTLV-1) can cause a rare type of T-cell acute lymphocytic leukemia. Most cases occur in Japan and the Caribbean area. This disease is not common in the United States.

In Africa, the Epstein-Barr virus (EBV) has been linked to Burkitt lymphoma, as well as to a form of acute lymphocytic leukemia. In the United States, EBV most often causes infectious mononucleosis ("mono").

Inherited syndromes

Acute lymphocytic leukemia does not appear to be an inherited disease. It does not seem to run in families, so a person's risk is not increased if a family member has the disease. But there are some inherited syndromes with genetic changes that seem to raise the risk of ALL. These include:

- Down syndrome
- Klinefelter syndrome
- Fanconi anemia
- Bloom syndrome
- Ataxia-telangiectasia
- Neurofibromatosis

Race/ethnicity

Acute lymphocytic leukemia is more common in whites than in African Americans, but the reasons for this are not clear.

Gender

Acute lymphocytic leukemia is slightly more common in males than in females. The reason for this is unknown.

Having an identical twin with ALL

Someone who has an identical twin who develops ALL in the first year of life has an increased risk of getting ALL.

Uncertain, unproven or controversial risk factors

Other factors that have been studied for a possible link to ALL include:

- Exposure to electromagnetic fields (such as living near power lines or using [cell phones](#))
- Workplace exposure to [diesel](#), gasoline, pesticides, and certain other chemicals

- [Smoking](#)
- Exposure to [hair dyes](#)

So far, none of these factors has been linked conclusively to ALL. Research in these areas continues.

- [References](#)

[See all references for Acute Lymphocytic Leukemia](#)

Last Medical Review: December 2, 2014 Last Revised: February 18, 2016

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Do We Know What Causes Acute Lymphocytic Leukemia?

Some people with acute lymphocytic leukemia (ALL) have one or more of the known risk factors (see [What are the risk factors for acute lymphocytic leukemia?](#)), but most do not. The cause of their cancer remains unknown at this time. Even when a person has one or more risk factors, there is no way to tell whether it actually caused the cancer.

During the past few years, scientists have made great progress in understanding how certain changes in DNA can cause normal bone marrow cells to become leukemia cells. Normal human cells grow and function based mainly on the information contained in each cell's chromosomes. Chromosomes are like bundles of long molecules of DNA in each cell. DNA is the chemical that makes up our genes – the instructions for how our cells function. We look like our parents because they are the source of our DNA. But our genes affect more than the way we look.

Some genes contain instructions for controlling when our cells grow and divide. Certain genes that help cells grow and divide are called *oncogenes*. Others that slow down cell growth and division or cause them to die at the right time are called *tumor suppressor genes*.

Each time a cell prepares to divide into 2 new cells, it must make a new copy of the DNA in its chromosomes. This process is not perfect, and errors can occur that may affect genes within the DNA. Cancers can be caused by DNA mutations (changes) that

turn on oncogenes or turn off tumor suppressor genes.

Translocations are the most common type of DNA change that can lead to leukemia. Human DNA is packaged in 23 pairs of chromosomes. A translocation means that DNA from one chromosome breaks off and becomes attached to a different chromosome. The point on the chromosome where the break occurs can affect genes – for example, it can turn on oncogenes or turn off genes that would normally help a cell mature.

The most common translocation in ALL in adults is known as the *Philadelphia chromosome*, which is a swap of DNA between chromosomes 9 and 22, abbreviated as t(9;22). It occurs in about 1 out of 4 adult ALL cases. Other, less common translocations are those between chromosomes 4 and 11, t(4;11), or 8 and 14, t(8;14).

Other chromosome changes such as *deletions* (the loss of part of a chromosome) and *inversions* (the rearrangement of the DNA within part of a chromosome) can also affect the development of ALL, although they are less common. In many cases of ALL, the gene changes that lead to the leukemia are not known.

Doctors are trying to figure out why these changes occur and how each of them might lead to leukemia. Not all cases of ALL have the same chromosome changes. Some changes are more common than others, and some seem to have more of an effect on a person's prognosis (outlook) than others.

Some people with certain types of cancer have inherited DNA mutations from a parent. These changes increase their risk for the disease. But ALL is very rarely caused by one of these inherited mutations.

Usually DNA mutations related to ALL occur during the person's lifetime rather than having been inherited before birth. They may result from exposure to [radiation](#) or cancer-causing chemicals, but in most cases the reason they occur is not known.

- [References](#)

[See all references for Acute Lymphocytic Leukemia](#)

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Can Acute Lymphocytic Leukemia Be Prevented?

The risk of many types of cancer can be reduced with lifestyle changes to avoid certain risk factors, but there is no known way to prevent most cases of leukemia at this time.

Most people who get acute lymphocytic leukemia have no known [risk factors](#), so there is no way to prevent these leukemias from developing.

- [References](#)

[See all references for Acute Lymphocytic Leukemia](#)

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