How to Use this Factsheet

This risk factor summary was developed to serve as a general fact sheet. It is an overview and should not be considered exhaustive. For more information on other possible risk factors and health effects being researched, please see the References section.

A risk factor is anything that increases a person's chance of developing cancer. Some risk factors can be controlled while others cannot. Risk factors can include *hereditary conditions*, *medical conditions or treatments*, *infections*, *lifestyle factors*, or *environmental exposures*. Although risk factors can influence the development of cancer, most do not directly cause cancer. An individual's risk for developing cancer may change over time due to many factors, and it is likely that multiple risk factors influence the development of most cancers. Knowing the risk factors that apply to specific concerns and discussing them with your health care provider can help to make more informed lifestyle and health care decisions.

For cancer types with environmentally-related risk factors, an important factor in evaluating cancer risk is the route of exposure. This is particularly relevant when considering exposures to chemicals in the environment. For example, a particular chemical may have the potential to cause cancer if it is inhaled, but that same chemical may not increase the risk of cancer through skin contact. In addition, the dose and duration of time one might be exposed to an environmental agent is important in considering whether an adverse health effect could occur.

Gene-environment interactions are another important area of cancer research. An individual's risk of developing cancer may depend on a complex interaction between their genetic makeup and exposure to an environmental agent (for example, a virus or a chemical contaminant). This may explain why some individuals have a fairly low risk of developing cancer as a result of an environmental factor or exposure, while others may be more vulnerable.

Key Statistics

The American Cancer Society estimates that approximately 54,270 individuals will be diagnosed with leukemia in the United States in 2015 (30,900 males and 23,370 females). Of these individuals, an estimated 6,250 will be diagnosed with acute lymphocytic leukemia (ALL). In Massachusetts, leukemia accounted for approximately 2.5% of all cancers diagnosed between 2007-2011.[9]

While ALL occurs predominantly among children (peaking between ages 2 and 4 years), an elevation in incidence is also seen among older individuals.[1, 4, 7] About 4 out of every 10 ALL diagnoses occur in adults.[1] ALL risk is lowest for adults aged 20 through 54 and then begins to rise again slowly.[1, 11] ALL is more common among whites than blacks and among males than females.[4]

Types of Leukemia

The term "cancer" is used to describe a variety of diseases associated with abnormal cell and tissue growth. Cancers are classified by the location in the body where the disease originated (the primary site) and the tissue or cell type of the cancer (histology).

Leukemia is a cancer of the bone marrow and blood. The types of leukemia are grouped according to how quickly the disease develops and progresses and what type of white blood cell is affected. Leukemia can arise in lymphoid cells (white blood cells called lymphocytes) or myeloid cells (red blood cells, platelet-making cells, or white blood cells other than lymphocytes). Leukemia that affects lymphoid cells is called lymphocytic leukemia. Leukemia that affects myeloid cells is called myeloid or myelogenous leukemia. Leukemia can be acute or chronic. Acute forms of leukemia progress more rapidly than chronic forms of leukemia, leading to different approaches to diagnosis and treatment.[1]

Leukemia is generally divided into four major subtypes: acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL), and chronic myeloid leukemia (CML). There are also a few rare types, such as hairy cell leukemia.[2] In U.S. adults, the most common subtypes are CLL and AML.[3, 11] ALL is expected to account for approximately 11.5% of all leukemia diagnoses in 2015.[3]

Established Risk Factors

Hereditary Conditions

ALL does not appear to be an inherited disease; however, individuals with certain inherited syndromes and conditions appear to be at increased risk of developing ALL. These inherited conditions include: [1, 7]

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

Environmental Exposures

Exposure to high-level ionizing radiation (e.g., by survivors of atomic bomb blasts or nuclear reactor accidents) is a known environmental risk factor associated with the development of ALL, usually within 6 to 8 years after exposure.[1, 7]

Possible Risk Factors

Environmental Exposures

Exposure to radiation therapy as treatment for another cancer may also raise a person's risk of developing ALL. Significant radiation exposure (e.g., diagnostic x-rays) to a fetus within the first few months of development may carry an increased risk of developing ALL, but studies have not been conclusive. The risk of ALL may be increased by exposure to certain chemicals, including benzene and certain chemotherapy drugs.[1]

Other Factors That Have Been Investigated

Few other factors for ALL have been identified. Some studies have reported an increased risk of leukemia associated with exposure to electromagnetic fields (e.g., living near power lines), cigarette smoke, hair dyes, and workplace exposure to diesel, gasoline, and certain other chemicals and solvents. However, none of these factors have been conclusively linked to ALL.[1, 5, 6]

ALL in Children

Leukemia is the most common type of childhood cancer, accounting for about 31% of all cancers diagnosed in children under 15 years old. The majority (84%) of these diagnoses are ALL. In the United States, an estimated 3,080 children and adolescents younger than 20 were diagnosed with ALL in 2014.[3] There is evidence that having an identical twin with ALL represents an increased risk. The risk appears to be highest if leukemia develops in the first year of life. Children born with Down syndrome and other conditions that result in abnormal immune function seem to be at increased risk of developing ALL.[2, 8] It is important to note, however, that for most children with leukemia, there is no known cause or risk factor.[2]

For More Information / References

Much of the information contained in this summary has been taken directly from the following sources. This material is provided for informational purposes only and should not be considered as medical advice. Persons with questions regarding a specific medical problem or condition should consult their physician.

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

1. ACS. 2015. Detailed Guide: Leukemia—Acute Lymphocytic
2. ACS. 2015. Detailed Guide: Leukemia—Chronic Lymphocytic
3. ACS. 2015. Cancer Facts & Figures 2015.
4. ACS. 2014. Detailed Guide: Childhood Leukemia.
5. ACS. 2014. Fact Sheet: Hair Dyes.
6. ACS. 2013. Fact Sheet: Diesel Exhaust.

American Society of Clinical Oncology (ASCO). http://www.cancer.net

7. ASCO. 2014. Guide to Leukemia – Acute Lymphocytic – ALL.
8. ASCO. 2014. Guide to Leukemia – Acute Lymphocytic – ALL – Childhood.

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9. MCR. 2014. Cancer Incidence and Mortality in Massachusetts 2007-2011: Statewide Report. Available at: http://www.mass.gov/eohhs/docs/dph/cancer/state/registry-statewide-report-07-11.pdf

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