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Acute Lymphoblastic Leukemia (ALL)

Acute lymphoblastic leukemia (ALL) is a cancer of the lymphocytes

Leukemia, a cancer of the blood, begins when normal blood cells change and grow uncontrollably. Acute lymphocytic leukemia is a cancer of the lymphocytes, a type of white blood cell involved in the body's immune system. ALL is also called acute lymphoid leukemia or acute lymphoblastic leukemia. Acute means that the disease begins and gets worse quickly; patients with ALL usually need immediate treatment[1].

ALL fast facts

- ALL makes up approximately **25%** of cancer diagnoses among children under 15, making it the most common cancer diagnosed in children in the United States[3]
- **6,020** people in the United States will be diagnosed with ALL annually according to 2014 estimates, including 3,140 males and 2,880 females[4]
- Roughly **1/3** of ALL diagnoses are adults[4]
- ALL is slightly more prevalent in **males** than in **females**, and in **whites** than in **African Americans**[5]
- ALL is most common in **young children** and **adults over 50**[1]

Lymphocytes are found in the blood, lymph nodes, and spleen

Lymphocytes are made in the bone marrow, the spongy, red tissue in the inner part of the large bones. New lymphocytes do not develop into mature cells among those with ALL, but stay as immature cells called lymphoblasts. There are three different types of lymphocytes: T cells, B cells, and natural killer (NK) cells. Generally, T cells fight infections by activating other cells in the immune system and by destroying infected cells, B cells make antibodies, and NK cells fight microbes and cancer cells. About 85% of people with ALL have the B-cell subtype and about 15% have the T-cell type. The NK-cell subtype is extremely rare[1].

The cause of ALL: bone marrow produces too many abnormal lymphocytes

In people with ALL, the abnormal cells crowd other types of cells in the bone marrow, preventing the production of red blood cells (which carry oxygen), other types of white blood cells, and platelets (parts of the blood needed for clotting). As a result, those with ALL may be anemic, more likely to get infections, and bruise or bleed easily. Lymphoblasts may also collect in a person's lymphatic system and cause swelling of the lymph nodes. Some cells may invade other organs, including the brain, liver, spleen, or the testicles in men[1].

ALL is divided into subtypes based on the type of lymphocytes that are affected

Subtypes include[2]:

- Acute precursor B-cell (pre B-cell) lymphoblastic leukemia
- Acute B-cell lymphoblastic leukemia
- Precursor T-cell acute lymphoblastic leukemia
- Philadelphia chromosome positive (BCR-ABL fusion) acute lymphoblastic leukemia

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[1] American Society of Clinical Oncology. Leukemia - Acute Lymphocytic - ALL: Overview. (Aug 2013 revision) http://www.cancer.net/cancer-types/leukemia-acute-lymphocytic-all/overview. Accessed October 2014.

[2] American Society of Clinical Oncology. Leukemia - Acute Lymphocytic - ALL: Subtypes and Classification. (Aug 2013 revision) http://www.cancer.net/cancer-types/leukemia-acute-lymphocytic-all/subtypes-and-classification. Accessed October 2014.

[3] Howlader, N., Noone, A. M., Krapcho, M, et al. SEER Cancer Statistics Review, 1975–2010. National Cancer Institute, April 2013; Section 28.9 (12). http://www.seer.cancer.gov/csr/1975_2010/results_merged/sect_28_childhood_cancer.pdf. Accessed June 2014.

[4] American Society of Clinical Oncology. Leukemia - Acute Lymphocytic - ALL: Statistics. (Aug 2013 revision). http://www.cancer.net/cancer-types/leukemia-acute-lymphocytic-all/statistics. Accessed November 2014.

About 5% of people with the B-cell type have a unique subtype called Burkitt leukemia or Burkitt lymphoma. About 20% to 30% of adults with ALL have a genetic change or mutation called the Philadelphia chromosome, causing two genes, BCR and ABL, to become one fusion gene called BCR-ABL[2].

Because leukemia usually does not form a solid tumor and is found throughout the body when diagnosed, there is no formal staging system for ALL

The general classifications of ALL include[2]:

- **Newly diagnosed and untreated.** A patient has decreased numbers of normal white blood cells, red blood cell, and platelets. Often there are many abnormal lymphoblasts in the blood and bone marrow.
- **Remission.** A patient has received treatment for ALL. The bone marrow contains less than 5% lymphoblasts, and the patient has no symptoms. The numbers of normal white blood cells, red blood cells, and platelets are normal.
- **Relapse.** Leukemia has come back after being in remission. Relapse is the most common cause of treatment failure in pediatric ALL, occurring in about 15%-20% of patients[2]. These incidents make relapsed ALL the fourth most common childhood malignancy[2].
- **Refractory.** Refractory leukemia means that the disease has not responded to treatment.

ALL fast facts

- The five-year relative survival rate in the United States is **68.8%** among ALL patients from 2003-2009[5]
- The five-year survival rate for varying age groups in the U.S. include:
  - **91.7%** for patients under 15[3]
  - **76.9%** for patients under 45[5]
  - **11.8%** for patients over 65[5]
- **1,440** deaths (810 male and 630 female) are estimated to occur in the United States annually due to ALL[6]
- About **80%-90%** of adults with ALL will have complete remissions, however roughly half of these patients relapse[7]

[5] National Cancer Institute. Surveillance, Epidemiology and End Results (SEER) Program Cancer Statistics Review (CSR) 1975-2010. Section 13 – Leukemia. http://seer.cancer.gov/archive/csr/1975_2010/. Accessed September 2014.

[6] American Cancer Society. Detailed Guide: ALL. What are the key statistics about acute lymphocytic leukemia? (July 2013 revision). http://www.cancer.org/cancer/leukemia-acutelymphocyticallinadults/detailedguide/leukemia-acute-lymphocytic-key-statistics. Accessed September 2014.

[7] American Cancer Society. Detailed Guide: ALL. Survival rates for acute lymphocytic leukemia (June 2014 revision). http://www.cancer.org/cancer/leukemia-acutelymphocyticallinadults/overviewguide/leukemia-all-overview-survival-rates. Accessed November 2014.