

Did you know:

OVER 82,000 NEW CASES OF LEUKAEMIA ARE DIAGNOSED EVERY YEAR IN EUROPE¹

Leukaemia is cancer of the white blood cells, and is classified according to which cells are affected. Acute Lymphoblastic Leukaemia (ALL) is a cancer of white blood cells known as lymphocytes.

These cells are important in fighting infection and other diseases.

There are two main types of blood cells:



Red blood cells

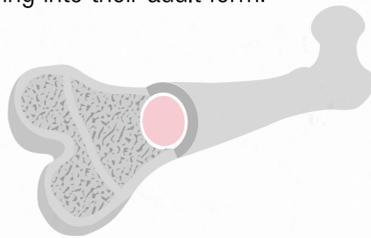
These carry and deliver oxygen throughout the body.



White blood cells (lymphocytes)

These are important for fighting infection and other diseases. There are two types: B cells and T cells.

Blood cells are produced in bone marrow, where they begin as stem cells before growing and maturing into their adult form.²



In ALL, too many immature white blood cells known as **lymphoblasts** are produced.

These build up uncontrollably in the bone marrow causing the number of other **blood cells to drop**.²

ALL is divided into subtypes, depending on which **white blood cells** are affected by the **cancer**.³

Tests used to make this diagnosis may include looking at specific proteins expressed on the cancer cells (immunophenotyping) or looking at changes in **chromosomes** (cytogenetics).^{4,5}

Physicians mostly use the World Health Organisation system of classification, which is based on the type of lymphocyte that has become cancerous. There are three main different **ALL** subtypes as follows:³

- Pre (precursor) B cell ALL – the most common type in adults
- Mature B cell ALL – this type is identified by particular genetic changes
- Pre (precursor) T cell ALL – more likely to affect young adults and more common in men

Symptoms of ALL

Fatigue – people affected are likely to feel tired for a long time and may experience breathlessness

Bruising and bleeding – due to the reduced number of platelets produced (molecules that help blood to clot), people with ALL may bruise easily or find that bleeding wounds are hard to stop

Infections – immature lymphoblasts are less effective at fighting infections than mature lymphocytes, so ALL sufferers may find an increase in the length or number of infections they experience

Weight loss – the extra stress your body is under and a general feeling of poor health can contribute to weight loss

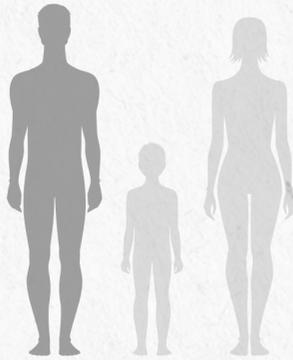
Enlarged lymph nodes – these may be in the neck but also the armpit or groin^{6,7}

WHO'S AFFECTED?

ALL is **more common in men** but also affects children and women.⁸

Adult ALL is rare and **progresses rapidly**.^{8,9}

Adult patients diagnosed with Ph (-) B-precursor ALL are also particularly young, with a **median age** at diagnosis of **34-39**.^{10,11}



RISK FACTORS FOR LEUKAEMIA INCLUDE:

Radiation exposure

Very high doses of radiation may cause leukaemia but this is extremely rare.



Genetic conditions

A small number of cases of ALL are thought to be due to inherited genetic disorders.



Weakened immunity

Those with a weakened immune system due to HIV or taking immunosuppressants after an organ transplant may be at higher risk.¹²



Many adult ALL sufferers **relapse** and the median survival rate for those who do is only

3-5

MONTHS.¹³

Treatments

Treatments available for ALL include cytotoxic chemotherapy, radiotherapy and **immunotherapy**.²

IMMUNOTHERAPY

aims to harness parts of the body's natural immune system to help fight cancer.¹⁴

REFERENCES

1. Ferlay J, Steliarova-Foucher E, Lortet-Tieulent J, et al. Cancer incidence and mortality patterns in Europe: Estimates for 40 countries in 2012. *Journal of Cancer* (2013) 49, 1374-1403.
2. NHS Choices (2015) Acute lymphoblastic leukaemia Introduction [online] Available at: <http://www.nhs.uk/Conditions/leukaemia-acute-lymphoblastic/Pages/introduction.aspx>.
3. Cancer Research UK (2015) Types of acute lymphoblastic leukaemia. Available at: www.cancerresearchuk.org/about-cancer/type/all/about/types-of-acute-lymphoblastic-leukaemia.
4. Cancer Research (2015) Tests for ALL. Available at: www.cancerresearchuk.org/about-cancer/type/all/diagnosis/tests-for-all.
5. Leukemia and Lymphoma Society (2015) ALL subtypes. Available at: www.lls.org/leukemia/acute-lymphoblastic-leukemia/diagnosis/all-subtypes.
6. Faderl S, O'Brien S, Pui C H, Stock W, Wetzler M, Hoelzer D, & Kantarjian H M. (2010). Adult acute lymphoblastic leukemia. *Cancer*, 116(5), 1165-1176.
7. Leukaemia & Lymphoma Research (2015) Acute lymphoblastic leukaemia (ALL) Patient information [online] Available at: https://leukaemialymphomaresearch.org.uk/sites/default/files/all_pi_booklet_mar15.pdf.
8. Cancer Research UK (2015) Acute lymphoblastic leukaemia risks and causes [online] Available at: <http://www.cancerresearchuk.org/about-cancer/type/all/about/acute-lymphoblastic-leukaemia-risks-and-causes>.
9. Mayo Clinic. "Acute lymphocytic leukemia." Available at: <http://www.mayoclinic.com/health/acute-lymphocytic-leukemia/DS00558>.
10. Kenderian SS et al. Monosomal karyotype in Philadelphia chromosome-negative acute lymphoblastic leukemia. *Blood Cancer Journal*. 2013;3(122): 1-2.
11. Faderl S, Kantarjian HM, Thomas DA, et al. Outcome of Philadelphia chromosome-positive adult lymphoblastic leukemia. *Leukemia and Lymphoma*. 2000;36(3-4):263-273.
12. NHS Choices (2015) Acute lymphoblastic leukaemia - Causes [online] Available at: <http://www.nhs.uk/Conditions/leukaemia-acute-lymphoblastic/Pages/Causes.aspx>.
13. Advani A.S. (2013) New immune strategies for the treatment of acute lymphoblastic leukemia: Antibodies and chimeric antigen receptors. *Hematology Am Soc Hematol Educ Program*.;2013:131-7. Available at: <http://asheducationbook.hematologylibrary.org/content/2013/1/131.long>.
14. Palucka, K., & Banchereau, J. (2012). Cancer immunotherapy via dendritic cells. *Nature Reviews Cancer*, 12(4), 265-277.

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