

Understanding Ph+ ALL

If you have received a diagnosis of Philadelphia chromosome-positive acute lymphoblastic leukemia (Ph+ ALL), you probably have many questions. This sheet can help you learn more about Ph+ ALL so you can take an active role in your treatment. Remember that you have reason to feel hopeful. Doctors learn more about Ph+ ALL every day.

Who gets Ph+ ALL?

Ph+ ALL can affect anyone, at any age. It is more common in adults than in children. The cause of Ph+ ALL is not yet known. Experts believe that there are probably many factors involved in its cause.

What is Ph+ ALL?

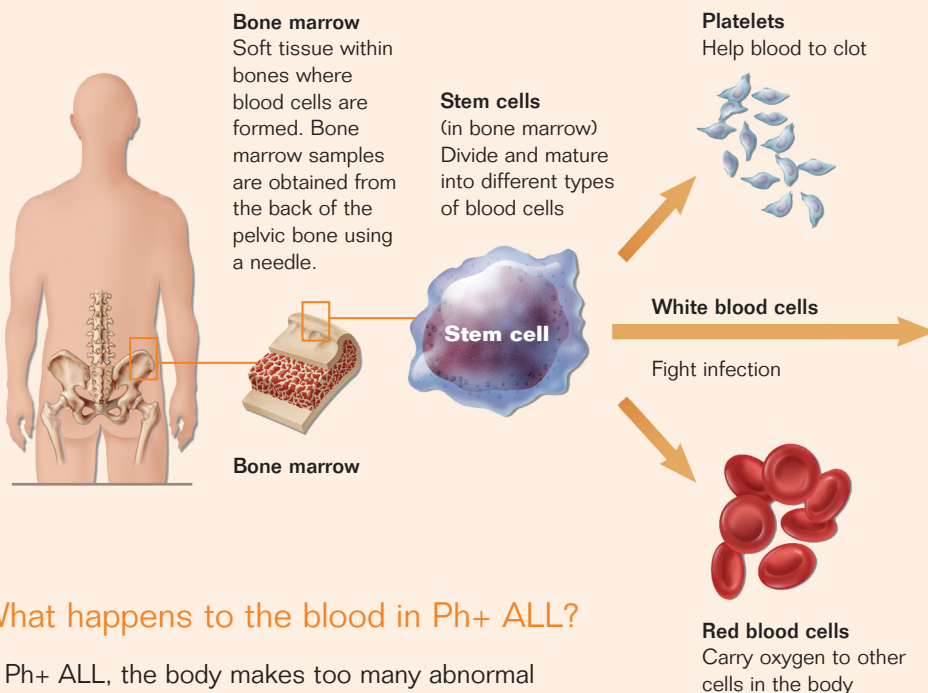
ALL is a cancer that begins in the bone marrow (the inner part of the bones where blood cells are made). In ALL, the body makes too many abnormal lymphocytes (a type of white blood cell that helps fight infection). As a result, there is not enough room for other kinds of blood cells to develop.

The symptoms of ALL can include tiredness or weakness (if there are too few red blood cells), infections and fever (if there are too few normal white blood cells), and bruising and bleeding (if there are too few platelets).

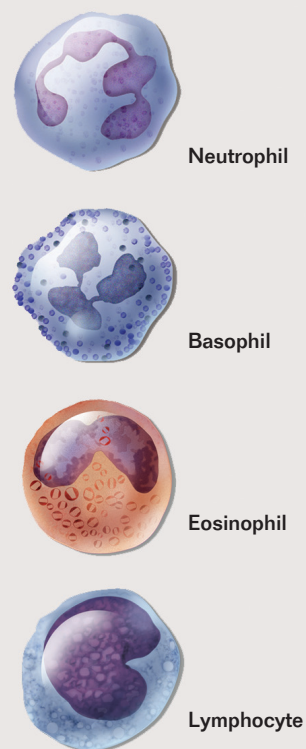
ALL has several types and subtypes. Ph+ ALL is one subtype.

How is blood produced?

Blood cell production begins in the bone marrow, where stem cells develop into different types of blood cells. Normal blood contains the right balance of red blood cells, white blood cells, and platelets to meet the body's needs.



Types of white blood cells



What happens to the blood in Ph+ ALL?

In Ph+ ALL, the body makes too many abnormal lymphocytes, called *blasts*, which do not develop fully. These blasts are leukemia cells. The number of leukemia cells grows very rapidly. As a result, there is not enough room for other kinds of blood cells to develop. Not having enough normal blood cells in the body causes the symptoms of ALL.

How is Ph+ ALL diagnosed?

Doctors may use several kinds of tests to diagnose ALL, including:

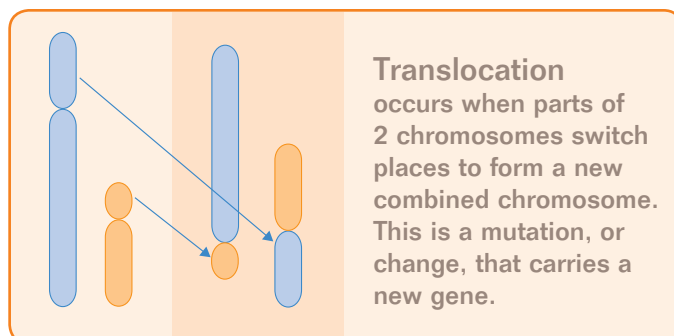
▶ **Blood tests** — Tell if the numbers of blood cells in the body are out of balance

▶ **Blood and bone marrow biopsy** — Tells if there are leukemia cells present, what size they are, and what they look like

▶ **Cytogenetic tests** — Show the number and shape of the chromosomes of the leukemia cells

How does Ph+ ALL start?

Ph+ ALL starts when parts of 2 chromosomes switch places with each other. This is called *translocation*. Chromosomes are parts of a cell that contain a person's genes (the body's instructions). This switch causes an abnormal chromosome, called the *Philadelphia (Ph) chromosome*, to form. The Ph chromosome carries a fusion gene (which is 2 genes accidentally joined) called *BCR-ABL*. This fusion gene makes an abnormal *tyrosine kinase*. Tyrosine kinases are proteins that normally regulate cell operations but, in Ph+ ALL, the abnormal tyrosine kinase stimulates overgrowth of white blood cells and prevents other normal blood cells from developing.



How is Ph+ ALL treated?

Ph+ ALL can be treated in several ways.

Treatment	How it works
Chemotherapy	Uses drugs to kill cancer cells or stop them from dividing
Radiation therapy	Uses high-energy x-rays or other types of radiation to kill cancer cells; may be used if cancer cells have spread to the brain or spinal cord
Stem cell transplant	Replaces the patient's sick blood-forming cells (stem cells), after they are destroyed by chemotherapy or radiation therapy, with bone marrow cells from a healthy sibling or unrelated donor
Molecularly targeted therapy	Blocks the abnormal tyrosine kinase released by the <i>BCR-ABL</i> gene, the source of leukemia cell growth

Resources for learning more about Ph+ ALL

Please contact your national cancer organization for more information about Ph+ ALL. Other sources of information are listed below.

■ **European Leukemia Network**
Germany
49-0-69-6301-6365
www.leukemia-net.org

■ **Leukaemia & Lymphoma Research**
UK
44-020-7405-0101
www.beatbloodcancers.org

■ **The Leukemia & Lymphoma Society**
USA
1-800-955-4572 (Toll-free)
www.LLS.org