LEUKEMIA & LYMPHOMA SOCIETY®

CLL Care

GLOSSARY

The following are some terms you may hear at diagnosis and throughout your treatment journey.

General

Antibodies. A type of protein created by blood cells when they are invaded by bacteria, viruses, or other harmful things called "antigens." Antibodies help the body fight against invaders that make people get sick. Antibodies can also be made in the lab and are used in treatment and to help find certain types of cancer.

Antigen. A foreign substance, mostly a protein, that creates an immune response when it is eaten, inhaled, or comes into contact with the skin or mucous membranes. Examples are bacteria, viruses and allergens. Antigens stimulate plasma cells to produce antibodies.

Basophil. A type of white blood cell present in certain allergic reactions.

Beta$_2$-microglobulin (B_2M). A protein that is shed from CLL cells. This test to measure B_2M is available in most laboratories in the United States.

Bone Marrow. A spongy tissue in the hollow central cavity of the bones where blood cells are made. By puberty, the marrow in the spine, ribs, breastbone, hips, shoulders and skull is most active in blood cell formation. In adults, the bones of the hands, feet, legs and arms no longer contain blood-forming marrow—these bones are filled with fat cells. When marrow cells have matured into blood cells, they enter the blood that passes through the marrow and are carried in the bloodstream throughout the body.

CD38. An antigen on CLL cells and other cells. The expression of CD38 may be a marker to assist in predicting CLL progression. See Cluster Designation.

Chromosome. Threadlike structures within cells that carry genes in a linear order. Human cells have 23 pairs of chromosomes: chromosome pairs 1 to 22 and one pair of sex chromosomes (XX for females and XY for males). See Translocation.

Chromosome Abnormalities. The missing, extra or irregular portion of chromosome DNA. There are numerical abnormalities such as when a person is missing one of the chromosomes from a pair (monosomy) or if a person has more than two chromosomes instead of a pair (trisomy). There are structural abnormalities in which a chromosome's structure is changed. This can be because of deletions, duplications, translocations, inversions and rings. See Translocation.

Clonal. The designation for a population of cells derived from a single transformed parent cell. Virtually all cancers are derived from a single cell with an injury (mutation) to its DNA and thus are monoclonal. Leukemia, lymphoma, myeloma and myelodysplastic syndromes are examples of clonal cancers; that is, cancers derived from a single abnormal cell.

Cluster Designation (CD). A term used with a number to identify a specific molecule on the surface of an immune cell. It is commonly used in its abbreviated form, for example, "CD20" (the target of the monoclonal antibody therapy rituximab [Rituxan®]) and "CD52" (the target of the monoclonal antibody therapy alemtuzumab [Campath®]).

Differentiation. When stem cells develop and mature and take on a new function. Stem cells will either mature into red blood cells, platelets or white blood cells. See Hematopoiesis.

Eosinophil. A white blood cell that helps to fight some parasitic infections and participates in allergic responses.

Erythrocytes. See Red Blood Cells.

General

Gene Mutations. A permanent change in the DNA sequence that makes up a gene, such that the sequence differs from what is found in most people.

Granulocyte. A type of white blood cell with many particles (granules) in the cell body. Neutrophils, eosinophils and basophils are types of granulocytes.

Hematopoiesis. The formation of all types of blood cells that starts in the marrow.

Immunoglobulin Heavy Chain Variable Region (*IgHv*) Gene Status. A marker that can distinguish between CLL subtypes (unmutated *IgHv* and mutated *IgHv*). People with CLL with unmutated *IgHv* gene status may have a more progressive form of the disease.

Intravenous Immune Globulin (IVIG). A product made up of antibodies that can be given intravenously (through a vein). IVIG is prepared from the blood donated by thousands of people, to make a concentrated collection of antibodies against many possible foreign substances the body might encounter. A CLL patient may need this is if his or her immune system has started attacking his or her body's normal cells.

Karyotype. The order, number and appearance of chromosomes within a cell. There are 46 human chromosomes with the sex chromosomes shown as a separate pair (either XX or XY). The 22 pairs with each cell are called "autosomes." See FISH (Fluorescence In Situ Hybridization); G-Banding Karyotyping in Diagnostic Tests and Staging section.

Lymphatic System. The system comprising the lymph nodes, the thymus gland (in the first several decades of life), the lymphatic channels, the lymphatic tissue of the marrow, the gastrointestinal tract, the skin and the spleen, along with the T lymphocytes, B lymphocytes and natural killer (NK) cells contained in those sites.

Lymph Nodes. Small structures, the size of beans that contain large numbers of lymphocytes and are connected with each other by small channels called "lymphatics." These nodes are distributed throughout the body. In patients with lymphoma and some types of lymphocytic leukemia, the malignant lymphocytes grow and expand the lymph nodes so that they may become enlarged.

Lymphocyte. A type of white blood cell that is important to the body's immune system. There are three major types of lymphocytes: B lymphocytes, which produce antibodies to help combat infectious agents, such as bacteria, viruses and fungi; T lymphocytes, which have several functions, including assisting B lymphocytes in making antibodies; and natural killer (NK) cells, which can attack virus-infected cells or tumor cells.

Macrophage. A monocyte in action (this is called a "scavenger cell"). When monocytes leave the blood and enter the tissue, they are known as "macrophages." Macrophages fight infection, eat dead cells and help lymphocytes with their immunity functions. See Monocyte.

Minimal Residual Disease (MRD). The small amounts of cancer cells that may remain after treatment. These cells are only identified by sensitive molecular techniques.

Monocyte. A type of white blood cell that represents about 5 to 10 percent of the cells in normal human blood.

Mutation. A change in the DNA that makes up a gene.

Neutropenia. An abnormal decrease in the number of neutrophils, a type of white blood cell, in the blood.

Neutrophil. A type of white blood cell and the main type that works to fight infection. People with some blood cancers, or those who have received treatment (such as chemotherapy) for cancer, often have low neutrophil counts. People with low neutrophil counts are very susceptible to infections.

General

Phagocytes. Cells that protect the body from infection by eating and killing microorganisms, such as bacteria and fungi. Neutrophils and monocytes are the two main types of these cells. Once an infection occurs, phagocytes migrate from the bloodstream and enter the infected tissue. Chemotherapy and radiation can decrease the numbers of these cells, so patients are more likely to get an infection.

Platelets. Also known as "thrombocytes," platelets are small colorless blood cells. They travel to and collect at the site of a wound. Once they get there, the platelets' sticky surface helps them to form clots and stop bleeding. Platelets make up about one tenth of the volume of red blood cells.

Red Blood Cells. Blood cells (erythrocytes) contain hemoglobin, which carries oxygen to the tissues of the body. Red blood cells make up about 40 to 45 percent of blood volume in healthy people.

Refractory Disease. A disease that does not go away or improve much after initial treatment.

Relapse/Recurrence. A return of the disease after it has been in remission following therapy.

Remission. When signs of a disease disappear. This usually follows treatment. The words "complete" and "partial" are sometimes used to further define the term "remission." Complete remission means that all evidence of the disease is gone. Partial remission means that the disease is markedly improved by treatment, but residual evidence of the disease is present.

Resistance to Treatment. When cancer cells continue to grow even after administration of strong drugs and/or treatments.

Spleen. This organ in the left upper portion of the abdomen just under the left side of the diaphragm, acts as a blood filter. Enlargement of the spleen is called "splenomegaly." Surgical removal of the spleen is known as "splenectomy."

Stem Cells. Primitive marrow cells that mature into red blood cells, white blood cells, and blood platelets. Stem cells are mostly found in the marrow, but some leave and circulate in the bloodstream. Stem cells can be collected, preserved, and used for stem cell therapy. See Hematopoiesis.

Thrombocytopenia. A disorder characterized by too few platelets in the blood.

Translocation. An abnormality of chromosomes in the marrow or lymph node cells that occurs when a piece of one chromosome breaks off and attaches to the end of another chromosome. In a balanced translocation, genetic material is exchanged between two different chromosomes with no gain or loss of genetic information. When a translocation takes place, the gene at which the break occurs is altered. This is one form of somatic mutation that may transform the gene into an oncogene (cancer-causing gene). See Mutation; Chromosome Abnormalities.

Treatment Sequencing. The determination of the best first-line treatment and order of therapies once treatment begins.

White Blood Cells. Also known as "leukocytes," the five types of infection-fighting cells in the blood. They are neutrophils, eosinophils, basophils, monocytes and lymphocytes.

ZAP-70. An abbreviation for the cell protein "zeta-chain-associated protein kinase 70." A high level of ZAP-70 expression on the cells of patients with B-cell CLL is one of several factors that may predict more progressive disease. Outside of a research laboratory this test is generally not very reliable and should not be used.

Healthcare Team

Cytogeneticist. A health care expert who uses special types of tests to look at cells and chromosomes.

Hematologist. A doctor who specializes in blood cell diseases.

Hematologist-Oncologist. A doctor who specializes in the diagnosis and treatment of blood cancers.

Hematopathologist. A doctor or scientist who studies the blood cells and blood tissues to identify disease.

Oncologist. A cancer doctor.

Pathologist. A doctor who finds and identifies disease by examining body tissue and fluids.

Diagnostic Tests and Staging

Banding of Chromosomes. Also called "G banding," this is a technique that uses dyes to stain cells. See G-Banding Karyotyping.

Binet Staging System. A system that uses physical examination and laboratory tests to assess the extent of disease and to classify patients into prognostic groups that include A, B and C with specific characteristics for each stage.

Bone Marrow Aspiration. A test to find abnormal marrow cells. The area around the hip bone is numbed and then a special needle is inserted and a marrow sample (fluid) is drawn out. Usually this test is done at the same time as a bone marrow biopsy.

Bone Marrow Biopsy. A test to find abnormal marrow cells. The area around the hip bone is numbed and then a special needle is inserted and a piece of bone containing marrow is withdrawn. Usually this test is done at the same time as a bone marrow aspiration.

Cytogenetic Analysis. A type of test that looks at the number and size of the chromosomes in cells. Cytogenetic testing is used for diagnosis, classification of disease, determining treatment regimens and to monitor disease status and recovery.

FISH (Fluorescence In Situ Hybridization). A technique to study chromosomes in tissue. It uses probes with fluorescent molecules that emit light of different wavelengths and colors. The probes match to the chromosomes within the cells, and the chromosomes fluoresce in color. FISH can be helpful in assessing risk and treatment needs. It can also monitor treatment effectiveness by providing a sensitive test to see abnormal cells, such as cells with deletions of 17p.

Flow Cytometry. A test that finds specific cell types within a cell sample. During this test, cells flow through the instrument called a "flow cytometer." When the cells pass through its laser beam, those with the antibody-specific features light up and can be counted. This test may be used to examine blood cells, marrow cells, or cells from a biopsy.

G-Banding Karyotyping. A testing method that makes a certain characteristic of chromosomes easier to see. A "karyotype" is the systematic arrangement, using images, of the 46 human chromosomes of a cell. Karyotypes are examined for deviations from the expected arrangement, number, size, shape or other characteristics of the chromosomes. Each chromosome pair has a characteristic banding pattern. To make the banding pattern easier to see, a dye called "Giemsa" may be used as a stain. This process is also referred to as "G-banding." Certain chromosomal abnormalities are associated with specific CLL subtypes. G-banding karyotyping and other cytogenetic tests provide doctors with information that contributes to determining the best treatment approach for an individual patient. The test takes longer than the FISH test, but has the advantage of being able to detect any changes that are visible because it does not rely on specific probes. Usually, both tests are done on samples from the marrow, especially at the time of diagnosis.

Diagnostic Tests and Staging

Immunoglobulin levels. This test finds the measurement of the concentration of immunoglobulins in the blood. Immunoglobulins are proteins, called "antibodies," which are made by B cells in healthy individuals to protect the body from infection. CLL cells do not make effective antibodies. CLL cells also interfere with the ability of the normal lymphocytes to make antibodies. As a result, people with CLL often have low levels of immunoglobulins, causing immune deficiency, which increases their risk of getting infections.

Immunophenotyping. A process used to find specific types of cells within a blood sample. It looks at antigens or markers on the surface of the cell to identify antibodies.

Polymerase Chain Reaction (PCR). A technique to expand trace amounts of DNA or RNA so that the specific type of the DNA or RNA can be studied.

Rai Staging System. A system that uses physical examination and laboratory tests to assess the extent of disease and to classify patients into prognostic groups that include low risk, intermediate risk and high risk with specific characteristics for each stage.

Treatments

Allogeneic Stem Cell Transplantation. A treatment that uses healthy donor stem cells to restore a patient's marrow and blood cells. See the free LLS booklet, *Blood and Marrow Stem Cell Transplantation,* at www.LLS.org/booklets.

Apheresis. A process using a machine to take out needed parts of the donor's blood and return the unneeded parts to the donor. This process lets certain blood components, including red blood cells, white blood cells and platelets to be removed separately and in large volumes. See Platelet Transfusion.

Bone Marrow Transplantation. See Allogeneic Stem Cell Transplantation.

Chemotherapy. A treatment that uses medicine (chemical agents) to kill cancer cells.

Clinical Trial. A carefully controlled research study conducted by doctors to improve the care and treatment of patients. A treatment that is proven safe and effective in a cancer clinical trial is often approved by the US Food and Drug Administration (FDA) for use as a standard treatment if it is more effective or has fewer side effects than the current standard treatment.

Growth Factor. A substance used to increase the numbers of neutrophils after chemotherapy. Granulocyte-colony stimulating factor (G-CSF) and granulocyte-macrophage colony stimulating factor (GM-CSF) are growth factors that can be made in the lab.

Immunotherapy. The term for several treatment approaches used by doctors to harness the body's immune system to treat CLL and other diseases. These therapies include monoclonal antibody therapy, radioimmunotherapy and vaccine therapy. The antibodies are used therapeutically in three ways: as "naked" antibodies (monoclonal antibodies), as antibodies to which radioactive isotopes are attached (radioimmunotherapy), and as antibodies to which toxins are attached (immunotoxins).

Monoclonal Antibody Therapy. A form of immunotherapy that uses monoclonal antibodies (proteins made in the laboratory that either react with or attach to specific antigens on the target cells) to target specific cells. See Immunotherapy.

Nonmyeloablative Allogeneic Stem Cell Transplantation. See Reduced-Intensity Stem Cell Transplantation.

Platelet Transfusion. This procedure transfers blood platelets from one patient to another. About six single-unit blood donors are often needed to provide enough platelets to raise the patient's platelet level. Platelet transfusions may help some CLL patients. See Apheresis. For more information, see the free LLS booklet, *Blood Transfusion,* at www.LLS.org/booklets.

Treatments

Radiation Therapy. A therapy that uses high-energy rays to destroy cancer cells. It is typically not part of standard CLL treatment but it is sometimes used to shrink an enlarged spleen, large lymph node masses, or masses in locations that interfere with the function of a neighboring body part, such as the kidney, the gastrointestinal tract or the throat. It can also be helpful in treating pain from bone damage caused by leukemia growing in the marrow.

Reduced-Intensity Stem Cell Transplantation. A type of allogeneic transplantation. Patients receive lower doses of chemotherapy drugs and/or radiation to prepare for a reduced-intensity transplant. See the free LLS booklet, *Blood and Marrow Stem Cell Transplantation,* at www.LLS.org/booklets.

Splenectomy. Surgical removal of an enlarged spleen. This may improve blood cell counts and reduce the need for transfusions. This approach is used selectively for patients who have severe recurrent bouts of autoimmune diseases that target either the red blood cells or platelets.

Stem Cell Transplantation. See Allogeneic Stem Cell Transplantation.

Targeted Therapies. The drugs used in these therapies target specific parts on the cancer cell. In most cases, the drugs administered in targeted therapies are given orally and are generally better tolerated than agents used in chemotherapy.

Watch and Wait. The use of doctor observation without drug treatment. People with CLL who have minimal changes in their blood counts and no symptoms are usually managed with observation alone. This approach includes regular medical examinations and regular testing to determine whether the disease is stable or beginning to progress.

Conditions

Chronic Lymphocytic Leukemia (CLL). A type of cancer of the blood and bone marrow. Abnormal lymphocytes accumulate in the blood, marrow, spleen, and lymph nodes.

Graft-Versus-Host Disease (GVHD). When the donor cells (“the graft”) attack the cells of the patient (“the host”), the condition is called “graft-versus-host disease” or GVHD. Most often this disease attacks a patient’s skin, liver, and the stomach and gastrointestinal tract. See the free LLS booklet, *Graft-Versus-Host Disease* at www.LLS.org/booklets.

Graft-Versus-Tumor Effect (Graft-Versus-Leukemia Effect). The potential immune reaction of transplanted (donor) T lymphocytes causing them to recognize and attack the cancer cells of the patient.

Prolymphocytic Leukemia. About 15 percent of people with CLL have leukemia cells that are a mix of lymphocytes and another type of white blood cell, called a “prolymphocyte.” Most people with this type of CLL follow a similar disease course to that of typical CLL. However, for a relatively small group of patients with this type of CLL, the blood cells may become mainly composed of prolymphocytes, the spleen may enlarge further, and the disease may become more aggressive and less responsive to treatment. In these cases, patients are encouraged to talk to their doctors about participating in a clinical trial.

Small Lymphocytic Lymphoma (SLL). A cancer in which the abnormal lymphocytes are primarily found in the marrow and the lymph nodes.

Signs, Symptoms and Complications

Anemia. A health condition that occurs when a person has a low number of red blood cells and therefore a low hemoglobin concentration. When this happens, it is hard for the blood to carry oxygen. People with severe anemia can be pale, weak, tired, and become short of breath.

Autoimmune Cytopenias. A production of antibodies against blood cells. These "autoantibodies" are usually directed against the patient's red blood cells and causes them to be removed rapidly from the blood. The loss of these red blood cells can worsen the effects of already low red blood cell counts. Autoimmune hemolytic anemia (AIHA), immunemediated thrombocytopenia (also known as "immune thrombocytopenic purpura" [ITP]) and pure red blood cell aplasia (PRCA) are the most frequent autoimmune cytopenias in CLL patients.

Cancer-Related Fatigue (CRF). A persistent feeling of physical or emotional exhaustion related to cancer or cancer treatment. CRF interferes with mood and outlook, ability to fulfill daily responsibilities, and enjoyment of life. CRF is more severe than fatigue that healthy people experience and is out of proportion to a person's level of exertion. For tips to manage CRF, text LIVINGWITHCLL to 411321.

Infection. CLL patients may be more susceptible to infections due to either the CLL itself and/or to its treatment. A higher risk of infection is caused by the inability of the person's CLL cells to make antibodies needed to fight infections. It is also caused by the effect of chemotherapy, which causes reduced blood cell counts for certain infection-fighting white blood cells in the blood, specifically neutrophils and monocytes.

Low Blood Cell Counts. Supportive care for CLL may include administering blood cell growth factors to improve low blood cell counts. The use of white blood cell growth factors may benefit patients who experience prolonged low white blood cell counts after treatment.

Richter Transformation. In a small number of patients, there is a progression in their disease. In these patients, CLL takes on the characteristics of an aggressive lymphoma (usually diffuse large B-cell lymphoma and less commonly Hodgkin lymphoma). This syndrome is much more common in patients with *IgHv*-unmutated CLL. Patients may have significantly enlarged lymph nodes, and may experience fevers and weight loss. Lymphocyte masses may also develop in parts of the body other than the lymph nodes. This change is not a second cancer, but a transformation of the CLL cells.

Second Cancers. People with CLL have a higher risk than people in the general population of developing a second cancer. The second cancers that are seen most frequently in CLL patients are acute myeloid leukemia, myelodysplastic syndromes, melanoma, gastrointestinal cancer, breast cancer, lung cancer, nonmelanoma skin cancer, prostate cancer, kidney cancer, bladder cancer and head and neck cancers.

Tumor Flare Reactions. Tumor flare is a painful enlargement of the lymph nodes that may be accompanied by elevated lymphocyte counts, enlarged spleen, low-grade fever, rash and bone pain. These reactions are commonly seen in CLL patients treated with lenalidomide (Revlimid®).

GET SUPPORT. REACH OUT TO OUR INFORMATION SPECIALISTS

The Leukemia & Lymphoma Society team consists of master's level oncology social workers, nurses and health educators who are available by phone Mon.–Fri., 9 a.m. to 9 p.m. (ET).

Contact us at **800.955.4572** or **www.LLS.org/InformationSpecialists.**

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