What is Non-Hodgkins Lymphoma?

Non-Hodgkins lymphomas are cancers of the lymph system. When lymphatic cells change (mutate) and grow unregulated by the processes that normally decide cell growth and death, they can form tumors.

The lymph system is made up of thin tubes that branch to all parts of the body. Its job is to fight infection and disease. The lymph system carries lymph, a colorless fluid containing white blood cells called lymphocytes. Lymphocytes fight germs in the body. B-lymphocytes (also called B-cells) make antibodies to fight bacteria, and T-lymphocytes (also called T-cells) kill viruses and foreign cells and trigger the B-cells to make antibodies.

Groups of bean-shaped organs called lymph nodes are located throughout the body at different sites in the lymph system. Lymph nodes are found in clusters in the abdomen, groins, pelvis, underarms, and neck. Other parts of the lymph system include the spleen, which makes lymphocytes and filters blood; the thymus, an organ under the breastbone; and the tonsils, located in the throat.

Because lymph tissue is found in so many parts of the body, non-Hodgkins lymphoma can start almost anywhere and can spread to almost any organ in the body. Common sites outside lymph nodes where lymphoma can start include the stomach, bowel and thyroid gland.

There are many different types of non-Hodgkins lymphoma. The types are generally described by how quickly the cancer is growing: low-grade, or "indolent," and high-grade or "aggressive" forms. These diseases are most common in adults, in who the low-grade and aggressive NHLs are about equally common. High-grade non-Hodgkins lymphomas are most common in children.

Disease types further describe the form of the cancer cells and the structure of the cancerous lymphatic tissue when viewed under the microscope. Follicular lymphoma cells form clusters, also known as "follicles" while diffuse cells are evenly distributed through lymphatic tissue. Non-Hodgkins lymphomas also are classified by whether they affect the B or T cells of the immune system. Most non-Hodgkins lymphomas (90%) affect the B cells.
Types and Subtypes of Non Hodgkins Lymphoma

The types and subtypes of non-Hodgkins lymphoma are determined by how the cells look under a microscope. About 35 different types of non-Hodgkins lymphoma are recognized. It is very important to identify these different types because they can behave very differently and treatments for different types of NHL vary according to the type.

**Low Grade** - These types of lymphoma grow very slowly and tend to be advanced by the time they cause symptoms. Around 85% to 90% of patients with these conditions have advanced (stage IV, see below) disease when they first present to an oncologist. They grow slowly, and usually respond well to several different types of treatment. They are usually not curable.

Common types of low grade NHL include:

- Follicular lymphomas, grades 1 & 2
- Small lymphocytic lymphoma (also known as chronic lymphocytic leukemia, CLL)
- Marginal zone lymphoma
- MALT lymphoma (lymphoma of mucosa associated lymphoid tissue)
- Mantel cell lymphoma

**High Grade** - These types of lymphoma grow rapidly, sometimes very rapidly. These conditions usually require chemotherapy, which is sometimes very intensive. These conditions are often curable.

Common types of aggressive NHL include:

- MALT lymphoma
- Diffuse large B-cell lymphoma
- Medistinal large B-cell lymphoma
- Burkitts lymphoma
- Lymphoblastic lymphoma

Some lymphomas cannot be easily classified as low grade or high grade. One example of this is a condition known as Mantle cell lymphoma, which has features of high grade and low-grade lymphoma.

There are many different types of lymphoma.

- Lymphomas are divided into two general types: Hodgkin’s lymphoma and non-Hodgkin’s lymphoma.

Age, gender, and a weakened immune system can affect the risk of developing adult non-Hodgkin’s lymphoma.

Risk factors for adult non-Hodgkin’s lymphoma include the following:

- Being older, male, or white.
Having one of the following medical conditions:
  - An inherited immune disorder.
  - An autoimmune disease.
  - HIV/AIDS.
  - Human T-lymphotrophic virus type I or Epstein-Barr virus.
  - A history of Helicobacter pylori infection.
- Taking immunosuppressant drugs after an organ transplant.
- Being exposed to certain pesticides.
- A diet high in meats and fat.
- Past treatment for Hodgkin’s lymphoma or with radiation.

Possible signs of adult non-Hodgkin’s lymphoma

These and other symptoms may be caused by adult non-Hodgkin’s lymphoma or by other conditions. A doctor should be consulted if any of the following problems occur:

- Painless swelling in the lymph nodes in the neck, underarm, groin, or stomach.
- Fever (unexplained).
- Drenching night sweats.
- Constant tiredness.
- Weight loss (unexplained) in the past 6 months.
- Skin rash or itchy skin.
- Pain in the chest, abdomen, or bones (unexplained).

Tests used to help detect and diagnose adult non-Hodgkin’s lymphoma.

The following tests and procedures may be used:

- **Physical exam and history**: An exam of the body to check general signs of health, including checking for signs of disease, such as lumps or anything else that seems unusual. A history of the patient’s health habits and past illnesses and treatments will also be taken.
- **Complete blood count**: A procedure in which a sample of blood is drawn and checked for the following:
  - The number of red blood cells, white blood cells, and platelets.
  - The amount of hemoglobin (the protein that carries oxygen) in the red blood cells.
  - The portion of the sample made up of red blood cells.
- **Blood chemistry studies**: A procedure in which a blood sample is checked to measure the amounts of certain substances released into the blood by organs and tissues in the body. An unusual (higher or lower than normal) amount of a substance can be a sign of disease in the organ or tissue that produces it.
- **Lymph node biopsy**: The removal of all or part of a lymph node. A pathologist views the tissue under a microscope to look for cancer cells. One of the following types of biopsies may be done:
  - **Excisional biopsy**: The removal of an entire lymph node.
  - **Incisional biopsy**: The removal of part of a lymph node.
  - **Core biopsy**: The removal of part of a lymph node using a wide needle.
- **Needle biopsy**: The removal of part of a lymph node using a thin needle. This procedure is also called a fine-needle aspiration biopsy.
- **Bone marrow biopsy**: The removal of a small piece of bone and bone marrow by inserting a needle into the hipbone or breastbone. A pathologist views both the bone and bone marrow samples under a microscope to look for signs of cancer.

**Certain factors affect prognosis and treatment options.**

The prognosis (chance of recovery) and treatment options depend on the following:

- The **stage** of the cancer.
- The type of non-Hodgkin's lymphoma.
- The patient’s age and general health.
- Whether the lymphoma has just been **diagnosed** or has **recurred** (come back).

As we well know, there are many kinds of cancer; unfortunately they all come about because of the out-of-control growth of abnormal cells.

**Healthy Cells vs. Cancer Cells**

Healthy cells are like a cat. They need structure to determine the size of bones and shape of the body, tail and whiskers. The DNA in genes and chromosomes determine this. They need energy to play and prowl and sustain life. This is derived from chemicals in food. Cats need a system to deliver chemicals (food nutrients like amino acids, carbohydrates, fats, vitamins and minerals) to all parts of their body. These are the blood vessels. Growth factors take a kitten into a lazy old cat, all the while helping it to function normally.

The body and its cells are mostly made up of protein. The building blocks of proteins are substances called amino acids that in the form of enzymes and hormones literally control every chemical reaction within the cells. When these are modified, different messages are sent to a complex control system that can alter their function. There are twenty different kinds of amino acids that are essential to life. Twelve of these can be synthesized within the body however; eight must be supplied by the daily diet.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Normal Cells</th>
<th>Cancer Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DNA</strong></td>
<td>DNA in genes and chromosomes go about their business in a normal way.</td>
<td>Cancer cells develop a different DNA or gene structure or acquire abnormal numbers of chromosomes.</td>
</tr>
<tr>
<td><strong>Cells</strong></td>
<td>Cells divide in an orderly way to produce more cells only when the body needs them.</td>
<td>Cells continue to be created without control or order. If not needed, a mass of tissue is formed which is called a tumor.</td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>Cells derive 70% of their energy from a system called the “Krebs Cycle.”</td>
<td>Cells have a defective “Krebs Cycle” and derive little or no energy from it.</td>
</tr>
</tbody>
</table>
Cells derive only 20% of their energy from a system called “Glycolosis.”

Cancer cells derive almost all their energy from “Glycolosis.”

Cells derive most of their energy with the use of oxygen.

Cells derive most of their energy in the absence of oxygen.

<table>
<thead>
<tr>
<th>Blood Vessels</th>
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<tbody>
<tr>
<td>Normal Cells</td>
<td></td>
<td></td>
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<tr>
<td>Cells have a built-in blood vessel system.</td>
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</tr>
<tr>
<td>Cancer Cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cells do not have a built-in blood vessel system. They require more of certain amino acids to grow.</td>
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<table>
<thead>
<tr>
<th>Growth Factors</th>
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<tbody>
<tr>
<td>Normal Cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>While similar to cancer cells, the amount of them is more in balance to produce a more normal level of activity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer Cells</td>
<td></td>
<td></td>
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<tr>
<td>These cells have over produced, require more chemicals (food) and are over active.</td>
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<table>
<thead>
<tr>
<th>Functions</th>
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</thead>
<tbody>
<tr>
<td>Normal Cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The enzymes and hormones go about business in a normal balanced manner.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer Cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The enzymes and hormones are either over active or under active.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Tumors are Different</th>
<th>Benign</th>
<th>Malignant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign tumors are not cancerous. They do not invade nearby tissues nor spread to other parts of the body. They can be removed and are not a threat to life.</td>
<td>Benign</td>
<td>Malignant</td>
</tr>
<tr>
<td>Malignant tumors are cancerous. They can invade and damage nearby tissues and organs and they can break away and enter the blood stream to form new tumors in other parts of the body. The spread of cancer is called metastasis.</td>
<td>Malignant</td>
<td>Malignant</td>
</tr>
</tbody>
</table>

After adult non-Hodgkin’s lymphoma has been diagnosed, tests are done to find out if cancer cells have spread within the lymph system or to other parts of the body.

The process used to find out the type of cancer and if cancer cells have spread within the lymph system or to other parts of the body is called staging. The information gathered from the staging process determines the stage of the disease. It is important to know the stage of the disease in order to plan treatment. The following tests and procedures may be used in the staging process:

- **Chest x-ray**: An x-ray of the organs and bones inside the chest. An x-ray is a type of energy beam that can go through the body and onto film, making a picture of areas inside the body.
- **CT scan (CAT scan)**: A procedure that makes a series of detailed pictures of areas inside the body, taken from different angles. The pictures are made by a computer linked to an x-ray machine. A dye may be injected into a vein or swallowed to help the organs or tissues show up more clearly. This procedure is also called computed tomography, computerized tomography, or computerized axial tomography.
• **PET scan (positron emission tomography scan):** A procedure to find malignant tumor cells in the body. A small amount of radionuclide glucose (sugar) is injected into a vein. The PET scanner rotates around the body and makes a picture of where glucose is being used in the body. Malignant tumor cells show up brighter in the picture because they are more active and take up more glucose than normal cells.

• **MRI (magnetic resonance imaging):** A procedure that uses a magnet, radio waves, and a computer to make a series of detailed pictures of areas inside the body. This procedure is also called nuclear magnetic resonance imaging (NMRI).

• **Gallium scan:** A procedure to detect areas of the body where cells, such as cancer cells, are dividing rapidly. A very small amount of radioactive material, gallium, is injected into a vein and travels through the bloodstream. The gallium collects in the bones or other tissues (organs) and is detected by a scanner.

• **Bone marrow biopsy:** The removal of a small piece of bone and bone marrow by inserting a needle into the hipbone or breastbone. A pathologist views both the bone and bone marrow samples under a microscope to look for signs of cancer.

• **Lumbar puncture:** A procedure used to collect cerebrospinal fluid from the spinal column. This is done by placing a needle into the spinal column. This procedure is also called an LP or spinal tap.

**The following stages are used for adult non-Hodgkin’s lymphoma:**

**Stage I**

Stage I adult non-Hodgkin’s lymphoma is divided into stage I and stage IE (“E” stands for extranodal and means that the cancer is found in an organ or tissue other than the lymph nodes).

- Stage I: Cancer is found in a single lymph node area.
- Stage IE: Cancer is found in an organ or tissue other than the lymph nodes.

**Indolent, Stage I and Contiguous Stage II Adult Non-Hodgkin’s Lymphoma**

Treatment of indolent, stage I and contiguous stage II adult non-Hodgkin’s lymphoma may include the following:

- Radiation therapy directed at the area where cancer is located.
- Radiation therapy directed at the area where cancer is located and nearby lymph nodes.
- Chemotherapy with radiation therapy.
- Chemotherapy alone or watchful waiting for patients who cannot have radiation therapy.
- Radiation therapy directed at part or all of the lymph system.

**Aggressive, Stage I and Contiguous Stage II Adult Non-Hodgkin’s Lymphoma**

Treatment of aggressive, stage I and contiguous stage II adult non-Hodgkin’s lymphoma is usually combination chemotherapy (chemotherapy using more than one drug) with
radiation therapy. Chemotherapy alone may also be used.

Stage II

Stage II adult non-Hodgkin’s lymphoma is divided into stage II and stage IIE (“E” stands for extranodal and means that the cancer is found in an organ or tissue other than the lymph nodes).

- Stage II: Cancer is found in two or more lymph node areas on the same side of the diaphragm (the thin muscle below the lungs that helps breathing and separates the chest from the abdomen).
- Stage IIE: Cancer is found in an organ or tissue other than the lymph nodes and may have spread to one or more lymph nodes on the same side of the diaphragm.

Stage III

Stage III adult non-Hodgkin’s lymphoma is divided into stage III, stage IIIE (“E” stands for extranodal and means that the cancer is found in an organ or tissue other than the lymph nodes), stage IIIS (“S” stands for spleen and means that the cancer is found in the spleen), and stage IIIS+E.

- Stage III: Cancer is found in lymph node areas on both sides of the diaphragm.
- Stage IIIE: Cancer is found in lymph node areas on both sides of the diaphragm and in one area of a nearby organ or tissue other than the lymph nodes.
- Stage IIIS: Cancer is found in lymph node areas on both sides of the diaphragm and in the spleen.
- Stage IIIS+E: Cancer is found in lymph node areas on both sides of the diaphragm, in one area of a nearby organ or tissue, and in the spleen.

Stage IV

In stage IV adult non-Hodgkin’s lymphoma, the cancer either:

- is found throughout at least one organ or tissue other than the lymph nodes and may be in lymph nodes near this organ or tissue; or
- has spread throughout one organ or tissue other than the lymph nodes and has spread to lymph nodes far away from that organ.

Adult non-Hodgkin’s lymphomas are also described in terms of how fast they grow and the location of affected lymph nodes.

Indolent or aggressive:

- Indolent lymphomas: These tend to grow and spread slowly and have few symptoms. They are also called low-grade lymphomas.
- Aggressive lymphomas: These grow and spread quickly and have severe symptoms. Lymphoblastic lymphoma, diffuse small noncleaved cell lymphoma and Burkitt lymphoma are 3 types of aggressive adult non-Hodgkin’s lymphoma.
Aggressive lymphomas are seen more frequently in patients who are HIV-positive (AIDS-related lymphoma). Aggressive lymphomas are also called intermediate-grade and high-grade lymphomas.

Contiguous or noncontiguous:

- Contiguous lymphomas: Lymphomas in which the lymph nodes containing cancer are next to each other.
- Noncontiguous lymphomas: Lymphomas in which the lymph nodes containing cancer are not next to each other, but are on the same side of the diaphragm.

There are different types of treatment for patients with non-Hodgkin’s lymphoma.

Different types of treatment are available for patients with non-Hodgkin’s lymphoma. Some treatments are standard (the currently used treatment), and some are being tested in clinical trials. Before starting treatment, patients may want to think about taking part in a clinical trial. A treatment clinical trial is a research study meant to help improve current treatments or obtain information on new treatments for patients with cancer. When clinical trials show that a new treatment is better than the standard treatment, the new treatment may become the standard treatment.

Types of standard treatment used are:

1. Radiation therapy

Radiation therapy is a cancer treatment that uses high-energy x-rays or other types of radiation to kill cancer cells. There are two types of radiation therapy. External radiation therapy uses a machine outside the body to send radiation toward the cancer. Internal radiation therapy uses a radioactive substance sealed in needles, seeds, wires, or catheters that are placed directly into or near the cancer. The way the radiation therapy is given depends on the type and stage of the cancer being treated.

2. Chemotherapy

Chemotherapy is a cancer treatment that uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping the cells from dividing. When chemotherapy is taken by mouth or injected into a vein or muscle, the drugs enter the bloodstream and can reach cancer cells throughout the body (systemic chemotherapy). When chemotherapy is placed directly into the spinal column, an organ, or a body cavity such as the abdomen, the drugs mainly affect cancer cells in those areas (regional chemotherapy). To treat certain types of adult non-Hodgkin's lymphoma that spread to the brain, CNS prophylaxis (chemotherapy given to kill cancer cells in the brain or spinal cord) may be used. The way the chemotherapy is given depends on the type and stage of the cancer being treated.

What are the side effects of treatment?
The methods used to treat lymphomas are very powerful. That is why the treatment often causes side effects. Fortunately, most side effects are temporary.

The side effects of chemotherapy depend mainly on the drugs given and the individual response of the patient. Chemotherapy commonly affects rapidly growing cells, such as blood cells that fight infection and cells that line the digestive tract. As a result, patients can have side effects such as a lowered resistance to infection, loss of appetite, nausea and vomiting, and mouth sores. They can also lose their hair. These side effects usually end after chemotherapy is finished.

During radiation therapy, patients can notice a number of side effects. They can become unusually tired as the treatment continues. Resting as much as possible is important. Skin reactions (redness or dryness) in the area being treated are common. Patients should be gentle with the treated area of skin. Lotions and creams should not be used without the doctor’s advice. When the chest and neck area is treated, patients may have a dry, sore throat and can have some trouble swallowing. Sometimes, they have shortness of breath or a dry cough. Radiation treatment to the lower abdomen can cause nausea, vomiting, or diarrhea. Some patients have tingling or numbness in their arms, legs, and lower back. These side effects gradually disappear when treatment is over.

Loss of appetite can be a problem for patients receiving chemotherapy or radiation therapy. Researchers are learning that patients who eat well are better able to tolerate the side effects of their treatment. Therefore, good nutrition is an important part of the treatment plan. Eating well means getting enough calories to prevent weight loss and having enough protein in the diet to build and repair skin, hair, muscles, and organs. Many patients find that eating several small meals and snacks throughout the day is easier than trying to have three large meals.

The side effects that patients have during cancer therapy vary from person to person and may even be different from one treatment to the next. Attempts are made to plan treatment to keep problems to a minimum. Doctors, nurses, and dietitians can explain the side effects of cancer treatment and can suggest ways to deal with them.

What happens after treatment for non-Hodgkin's lymphoma?

Regular follow-up exams are very important for anyone who has been treated for non-Hodgkin's lymphoma. Most relapses occur in the first 2 years after therapy.

Generally, checkups include a careful physical exam, x-rays, blood tests, and other laboratory tests. Patients should follow their doctor's recommendations on health care and checkups. Having regular checkups allows problems to be detected and treated promptly should they arise.

When people have cancer, life can change for them and for the people who care about them. These changes in daily life can be difficult to handle. It is natural for a person with non-Hodgkin's lymphoma to have many different and sometimes confusing emotions.

At times, patients and family members may be depressed, angry, or frightened. At other times, feelings may vary from hope to despair or from courage to fear. Patients usually are better able to cope with their emotions if they can talk openly about their illness and
their feelings with family members and friends.

Concerns about the future, as well as about medical tests, treatments, a hospital stay, and medical bills, are common. Talking to doctors, nurses, or other members of the health care team may help to ease fear and confusion. Patients can take an active part in decisions about their medical care by asking questions about their treatment. Patients and family members often find it helpful to write down questions for the doctor as they think of them. Taking notes during visits to the doctor can help them remember what was said. They should ask the doctor to explain anything that is not clear.

Patients have many important questions to ask about their disease, and their doctor is the best person to provide answers. Most people want to learn what type of lymphoma they have, how the disease can be treated, and how successful the treatment is likely to be.

*Source: A.P. John Institute for Cancer Research*

When considering any type of complementary cancer treatment or alternative cancer treatment, always consult with your physician first, as possible interactions could reduce your treatment protocol’s efficacy.