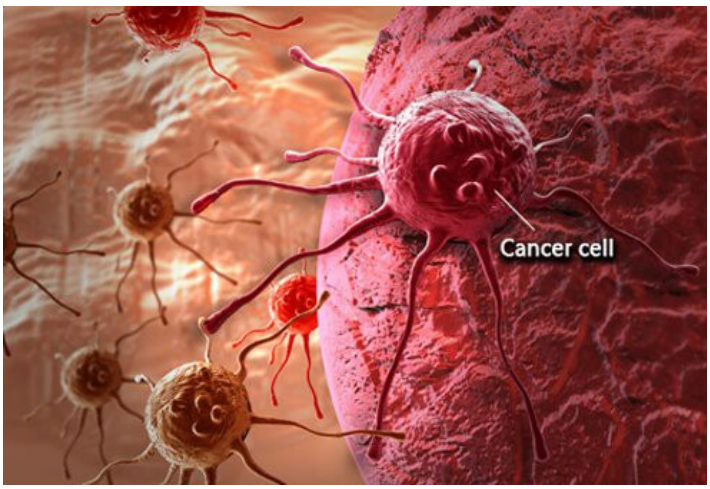
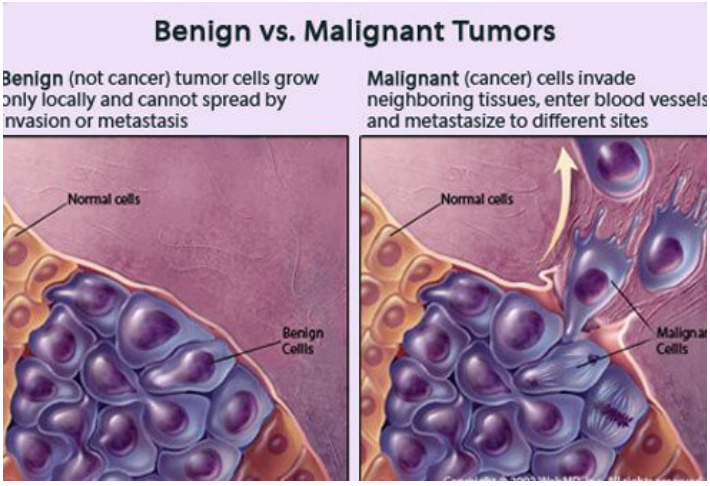
Understanding Cancer



What Is Cancer?

In the most basic terms, cancer refers to cells that grow out-of-control and invade other tissues. Cells may become cancerous due to the accumulation of defects, or mutations, in their DNA. Certain inherited genetic defects (for example, BRCA1 and BRCA2 mutations) and infections can increase the risk of cancer. Environmental factors (for example, air pollution) and poor lifestyle choices—such as smoking and heavy alcohol use—can also damage DNA and lead to cancer.

Most of the time, cells are able to detect and repair DNA damage. If a cell is severely damaged and cannot repair itself, it usually undergoes so-called programmed cell death or apoptosis. Cancer occurs when damaged cells grow, divide, and spread abnormally instead of self-destructing as they should.



Malignant Tumors Vs. Benign Tumors

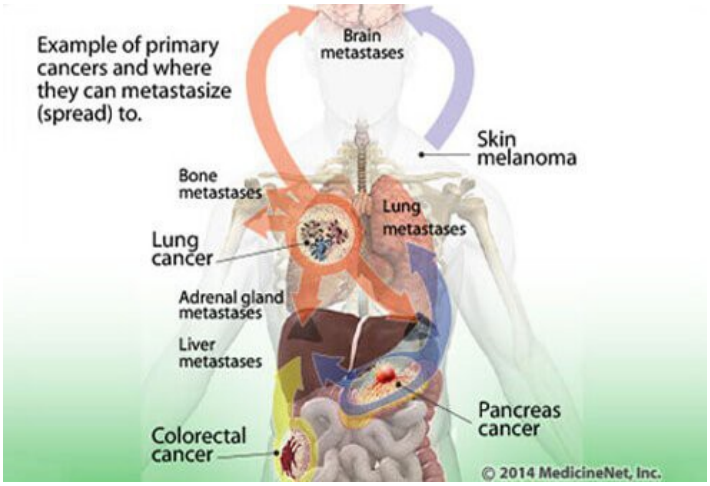
A tumor is an abnormal mass of cells. Tumors can either be benign (non-cancerous) or malignant (cancerous).

Benign Tumors

Benign tumors grow locally and do not spread. As a result, benign tumors are not considered cancer. They can still be dangerous, especially if they press against vital organs like the brain.

Malignant Tumors

Malignant tumors have the ability to spread and invade other tissues. This process, known as metastasis, is a key feature of cancer. There are many different types of malignancy based on where a cancer tumor originates.

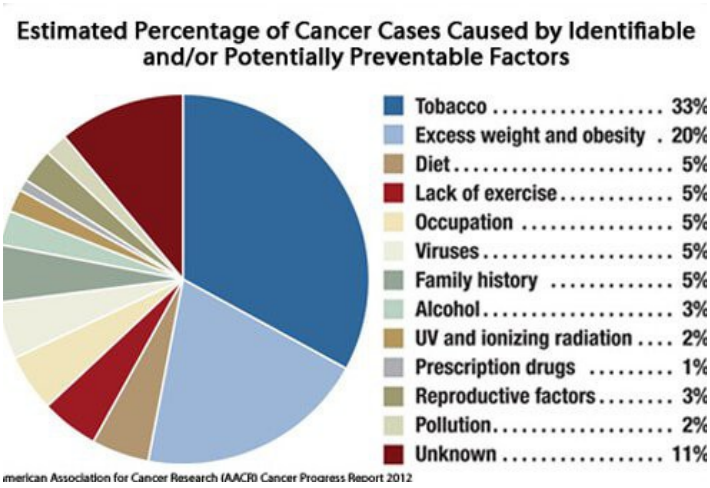


Cancer Metastasis

Metastasis is the process whereby cancer cells break free from a malignant tumor and travel to and invade other tissues in the body. Cancer cells metastasize to other sites via the lymphatic system and the bloodstream. Cancer cells from the original—or primary—tumor can travel to other sites such as the lungs, bones, liver, brain, and other areas. These metastatic tumors are "secondary cancers" because they arise from the primary tumor.

What Is Metastasized Cancer?

Metastatic cancer retains the name of the primary cancer. For example, bladder cancer that metastasizes to the liver is not liver cancer. It is called metastatic bladder cancer. Metastasis is significant because it helps determine the staging and treatment. Some types of metastatic cancer are curable, but many are not



What Causes Cancer?

Certain genes control the life cycle—the growth, function, division, and death—of a cell. When these genes are damaged, the balance between normal cell growth and death is lost. Cancer cells are caused by DNA damage and out-of-control cell growth. The following is a partial list of factors known to damage DNA and increase the risk of cancer:

Mutations Cause

Genetic mutations may cause cancer. For example, mutations of genes BRCA1 and BRCA2 (linked to an increased risk of breast and ovarian cancers) can inhibit the body's ability to safe-guard and repair DNA. Copies of these mutated genes can be passed on genetically to future generations, leading to a genetically-inherited increased risk of cancer.

Environment Cause

Cancer may be caused by environmental exposure. Sunlight can cause cancer through ultraviolet radiation. So can air pollutants like soot, wood dust, asbestos, and arsenic, to name just a few.

Microbes Cause

Some microbes are known to increase cancer risks. These include bacteria like H. pylori, which causes stomach ulcers and has been linked to gastric cancer. Viral infections (including Epstein-Barr, HPV, and hepatitis B and C) have also been linked to cancer.

Lifestyle and Diet Causes

Lifestyle choices can lead to cancer as well. Eating a poor diet, inactivity, obesity, heavy alcohol use, tobacco use including smoking, and exposure to chemicals and toxins are all associated with greater cancer risk.

Causes of Cancer: Treatment

Medical treatment with chemotherapy, radiation, targeted treatments (drugs designed to target a specific type of cancer cell) or immunosuppressive drugs used to decrease the spread of cancer throughout the body can also cause damage to healthy cells. Some "second cancers", completely separate from the initial cancer, have been known to occur following aggressive cancer treatments; however, researchers are producing drugs that cause less damage to healthy cells (for example, targeted therapy).

Cancer Symptoms and Signs

There are more than 100 different types of cancer. Every cancer and every individual is unique. Cancer symptoms and signs depend on the size and location of the cancer as well as the presence or absence of metastasis.

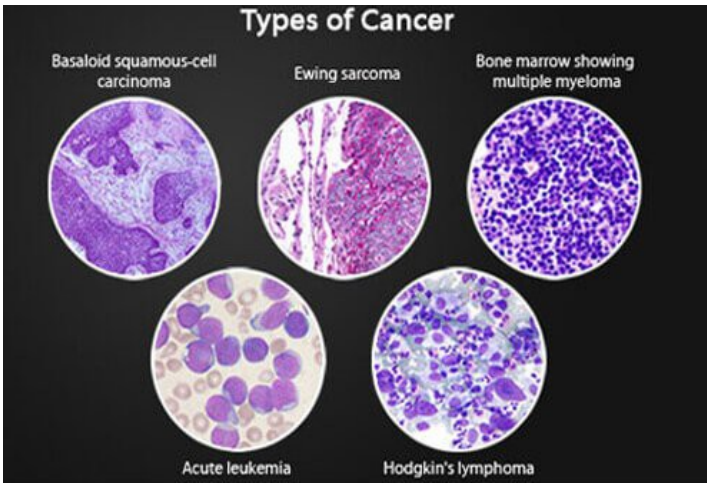
Common Cancer Symptoms and Signs

Symptoms and signs of cancer may include:

- Fever
- Pain
- Fatigue
- Skin changes (redness, sores that won't heal, jaundice, darkening)
- Unintended weight loss or weight gain

Other more obvious signs of cancer may include:

- Lumps or tumors (mass)
- Difficulty swallowing
- Changes or difficulties with bowel or bladder function
- Persistent cough or hoarseness
- Short of breath
- Chest pain
- Unexplained bleeding or discharge



6 Types of Cancer

Cancer can occur anywhere in the body. Broadly, cancers are classified as either solid (for example breast, lung, or prostate cancers) or liquid (blood cancers). Cancer is further classified according to the tissue in which it arises.

What Is Carcinoma?
Carcinomas are cancers that occur in epithelial tissues in the body. They comprise 80% to 90% of all cancers. Most breast, lung, colon, skin, and prostate cancers are carcinomas. This class includes the two most common skin cancers, basal cell carcinoma and squamous cell carcinoma. Also in this class is the glandular cancer adenocarcinoma.

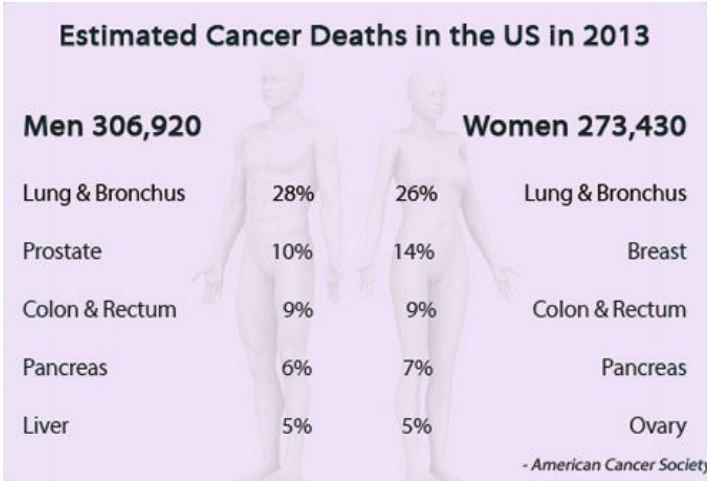
What Is Sarcoma Cancer?
Sarcomas occur in connective tissue like the bones, cartilage, fat, blood vessels, and muscles. This class of cancers includes the bone cancers osteosarcoma and Ewing sarcoma, Kaposi sarcoma (which causes skin lesions), and the muscle cancers rhabdomyosarcoma and leiomyosarcoma.

What Is Myeloma Cancer?
Myelomas are cancers that occur in plasma cells in the bone marrow. This class of cancer includes multiple myeloma, also known as Kahler disease.

What Is Leukemia?
Leukemias are a group of different blood cancers of the bone marrow. They cause large numbers of abnormal blood cells to enter the bloodstream.

What Is Lymphoma Cancer?
Lymphomas are cancers of the immune system cells. These include the rare but serious Hodgkin lymphoma (Hodgkin's lymphoma, also Hodgkin's disease) and a large group of white blood cell cancers known collectively as non-Hodgkin lymphoma (non-Hodgkin's lymphoma).

What Is Mixed Cancer?
Mixed cancers arise from more than one type of tissue.



7 Common Cancers

Cancer is the second leading cause of death in the United States. The most common cancers diagnosed in the U.S. are those of the breast, prostate, lung, colon and rectum, and bladder. Cancers of the lung, colon and rectum, breast, and pancreas are responsible for the most deaths. The prognosis of different cancers is highly variable. Many cancers are curable with early detection and treatment. Cancers that are aggressive or diagnosed at a later stage may be more difficult to treat, and can even be life threatening.

What Is a Breast Cancer?
Breast cancer is the most common cancer in the United States, and one of the deadliest. About one in eight women will develop invasive breast cancer at some point in her life. Though death rates have decreased since 1989, more than 40,000 U.S. women are thought to have died from breast cancer in 2015 alone.

What Is Lung Cancer?
Lung cancer is the second-most-common cancer in the United States, and it is the deadliest for both men and women. In 2012, more than 210,000 Americans were diagnosed with lung cancer, and in the same year more than 150,000 Americans died from lung cancer. Worldwide, lung cancers are the most common cancers.

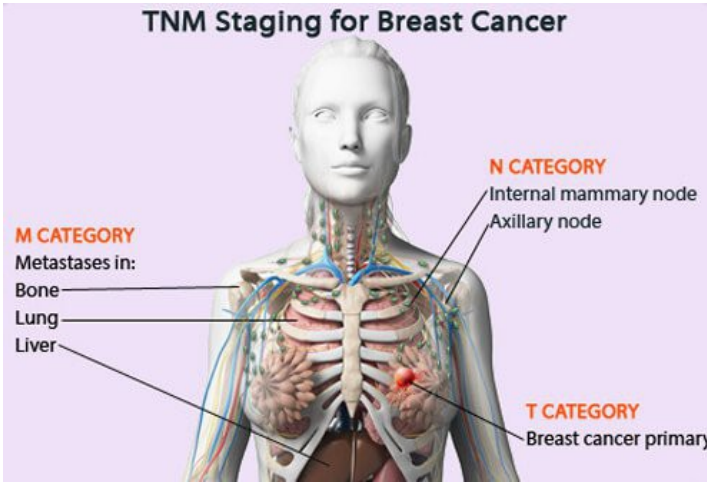
What Is a Prostate Cancer?
Prostate cancer is the most common cancer found in men. In 2013, more than 177,000 Americans were diagnosed with prostate cancer, and more than 27,000 American men died from prostate cancer.

What Is a Colorectal Cancer?
Of the cancers that can impact both men and women, colorectal cancer is the second-greatest killer in the United States.

What Is a Liver Cancer?
Liver cancer develops in about 20,000 men and 8,000 women each year. Hepatitis B and C and heavy drinking increase one's risk of developing liver cancer.

What Is a Ovarian Cancer?
About 20,000 American women are diagnosed with ovarian cancer each year. For American women, ovarian cancer is the eighth most common cancer and the fifth leading cause of cancer death.

What Is a Pancreatic Cancer?
Pancreatic cancer has the highest mortality rate of all major cancers. Of the roughly 53,000 Americans diagnosed with pancreatic cancer each year, only 8 percent will survive more than five years.

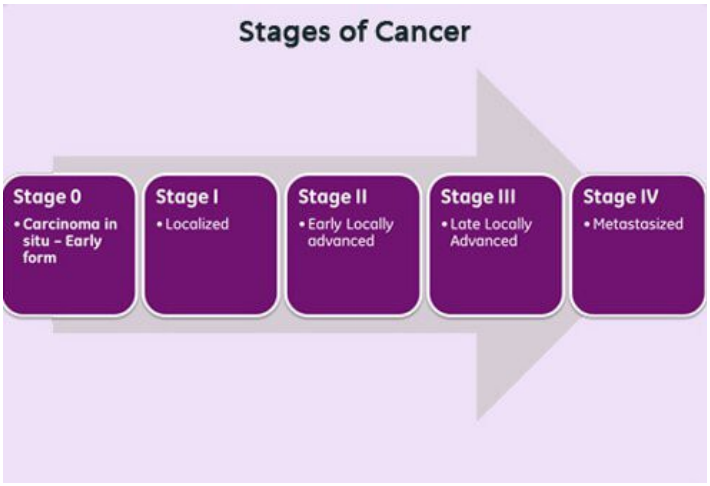


How Stages of Cancer Are Determined

Doctors use the stages of cancer to classify cancer according to its size, location, and extent of spread. Staging helps doctors determine the prognosis and treatment for cancer. The TNM staging system classifies cancers according to:

- Tumor (T): Primary tumor size and/or extent
- Nodes (N): Spread of cancer to lymph nodes in the regional area of the primary tumor
- Metastasis (M): Spread of cancer to distant sites away from the primary tumor

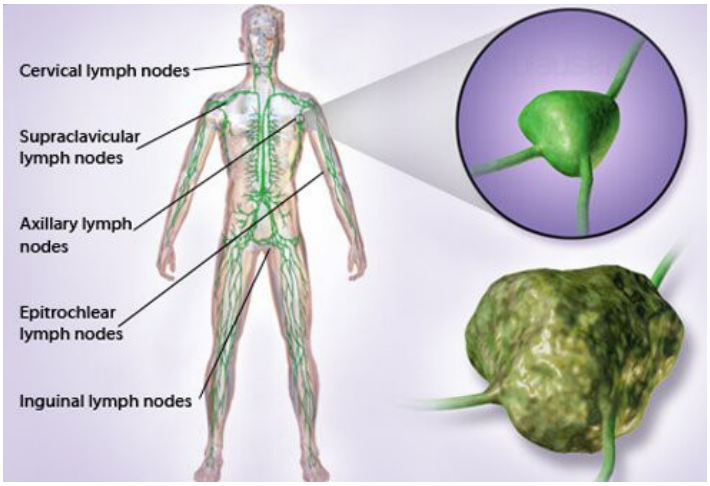
Some cancers, including those of the brain, spinal cord, bone marrow (lymphoma), blood (leukemia), and female reproductive system, do not receive a TNM classification. Instead, these cancers are classified according to a different staging systems.



What Are The Stages of Cancer?

The TNM classification of a cancer usually correlates to one of the following five stages.

- Stage 0: This refers to cancer that is "in situ," meaning that cancerous cells are confined to their site of origin. This type of cancer has not spread and is not invading other tissues.
- Stage I – Stage III: These higher stages of cancer correspond to larger tumors and/or greater extent of disease. Cancers in these stages may have spread beyond the site of origin to invade regional lymph nodes, tissues, or organs.
- Stage IV: This type of cancer has spread to distant lymph nodes, tissues, or organs in the body far away from the site of origin.



Diagnosing Cancer

Various tests may be performed in order to confirm a cancer diagnosis. Positron Emission Tomography and Computed Tomography (PET-CT) Scans and other similar tests can highlight “hot spots” of cancer cells with high metabolic rates.
The most common test and procedures used to diagnose cancer include:

- Mammogram
- Pap Test
- Tumor Marker Test
- Bone Scan
- MRI
- Tissue Biopsy
- PET-CT Scan

The Role of Lymph Nodes in Cancer Diagnosis

Cancer that originates in the lymph nodes or other area of the lymphatic system is called lymphoma. Cancer that originates elsewhere in the body can spread to lymph nodes. The presence of metastasized cancer in the lymph nodes is may mean the cancer is growing quickly and/or is more likely to spread to other sites. The presence of cancer in lymph nodes often affects prognosis and treatment decisions. Many diagnostic tests look at the lymph nodes as an indicator.

What Are Treatment Options?

The treatment is highly variable depending on the type and stage of a cancer as well as the overall health of the patient. The most common treatments are surgery, radiation, and chemotherapy. Other treatments include targeted/biological therapies, hematopoietic stem cell transplants, angiogenesis inhibitors, cryosurgery, and photodynamic therapy.

Every treatment has potential risks, benefits, and side effects. The patient and his or her care team, which may include an internist or other specialist, surgeon, oncologist, radiation oncologist, and others, will help determine the best and most appropriate course of treatment.

Is There a Cure for Cancer?

Despite enormous effort and funding, no one cure has been found yet to eliminate cancer. In 2016, the United States announced a $1 billion investment into creating such a cure, named the "National Cancer Moonshot" by President Barack Obama.

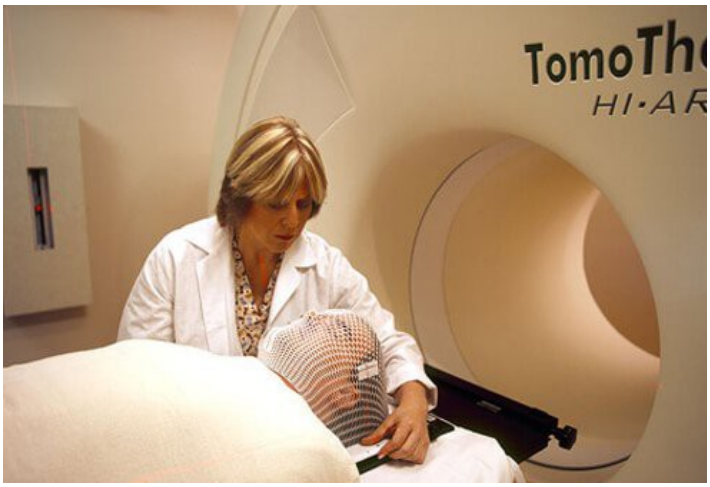
Until a cure can be found, prevention through a healthy lifestyle is the best way to stop cancer. Some ways to help protect yourself from cancer include eating plenty of fruits and vegetables, maintaining a healthy weight, abstaining from tobacco, drinking only in moderation, exercising, avoiding sun damage, getting immunizations, and getting regular health screenings.

Surgery

Surgery is often performed to remove malignant tumors. Surgery allows for the determination of the exact size of the tumor as well as the extent of spread and invasion into other nearby structures or lymph nodes– all-important factors in prognosis and treatment. Surgery is often combined with other cancer treatments, such as chemotherapy and/or radiation.

Sometimes, cancer cannot be entirely surgically removed because doing so would damage critical organs or tissues. In this case, debulking surgery is performed to remove as much of the tumor as is safely possible. Similarly, palliative surgery is performed in the cases of advanced cancer to reduce the effects (for example, pain or discomfort) of a cancerous tumor. Debulking and palliative surgeries are not curative, but they seek to minimize the effects of the cancer.

Reconstructive surgery can be performed to restore the look or function of part of the body after cancer surgery. Breast reconstruction after a mastectomy is an example of this kind of surgery.



Radiation Therapy

Radiation is a very common cancer treatment. About 50% of all cancer patients will receive radiation treatment, which may be delivered before, during, or after surgery and/or chemotherapy. Radiation can be delivered externally -- where X-rays, gamma rays, or other high-energy particles are delivered to the affected area from outside the body -- or it can be delivered internally. Internal radiation therapy involves the placement of radioactive material inside the body near cancer cells. This is called brachytherapy.

Systemic radiation involves the administration of radioactive medication by mouth or intravenously. The radioactive material travels directly to the cancerous tissue. Radioactive iodine (I-131 for thyroid cancer) and strontium-89 (for bone cancer) are two examples of systemic radiation treatments.

Typically, external radiation is delivered 5 days a week over the course of 5 to 8 weeks. Other treatment regimens are sometimes used.

Chemotherapy Procedure

Chemotherapy, or "chemo," refers to more than 100 different medications used to treat cancer and other conditions.

If eliminating all cancer cells is not possible, the goals of treatment may be to slow the growth of the cancer, keep the cancer from spreading, and/or relieve cancer-associated symptoms (such as pain).

Depending on the type of chemotherapy prescribed, the medications may be given by mouth, injection, intravenously (IV), or topically. IV chemotherapy may be delivered via a catheter or port, which is usually implanted in a blood vessel of the chest for the duration of the therapy. Sometimes chemotherapy is delivered regionally, directly to the area that needs treatment. For example, intravesical therapy is used to infuse chemotherapy directly into the bladder for the treatment of bladder cancer.

The chemotherapy regimen a patient receives depends upon the type and stage of the cancer, any prior cancer treatment, and the overall health of the patient. Chemotherapy is usually administered in cycles over the course of days, weeks, or months, with rest periods in between.

Other Treatments

In addition to surgery, radiation, and chemotherapy, other therapies are used to treat cancer. These include:

Targeted or Biological Therapies

Targeted or biological therapies seek to treat cancer and boost the body's immune system while minimizing damage to normal, healthy cells. Monoclonal antibodies, immunomodulating drugs, vaccines, and cytokines are examples of targeted or biological therapies.

Hematopoietic Stem Cell Transplants

Hematopoietic stem cell transplants involve the infusion of stem cells into a cancer patient after the bone marrow has been destroyed by high-dose chemo and/or radiation.

Angiogenesis Inhibitors

Angiogenesis inhibitors are medications that inhibit the growth of new blood vessels that cancerous tumors need in order to grow.

Cryosurgery

Cryosurgery involves the application of extreme cold to kill precancerous and cancerous cells.

Photodynamic Therapy

Photodynamic therapy (PDT) involves the application of laser energy of a specific wavelength to tissue that has been treated with a photosensitizing agent, a medication that makes cancerous tissue susceptible to destruction with laser treatment. Photodynamic therapy selectively destroys cancer cells while minimizing the damage to normal, healthy tissues nearby.

Ongoing Research

Ongoing cancer research continues to identify newer, less toxic, and more effective cancer treatments. Visit the National Cancer Institute (NCI) to see a list of ongoing clinical trials.

Source: https://www.medicinenet.com/cancer_101_pictures_slideshow/article.htm

Reviewed by Charles Patrick Davis, MD, PhD on Friday, July 22, 2016
Understanding Cancer: Metastasis, Stages of Cancer, and More