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Step 1: What is Cancer?

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Welcome to Cancer Tutor. Our extensive database of science-based, peer-reviewed material is here to guide you through this season of your life.

First, be thankful; you are alive during a time when information can literally save your life! There are volumes of studies and thriver testimonials to help shed light on your cancer journey.

Integrative cancer treatments – those that combine the best of natural regimens and conventional approaches – have made significant strides in recent decades. Many of the top cancer researchers are probing how to better utilize integrative treatments for cancer.

At Cancer Tutor, we are committed to providing this information free of charge to those who seek it. We will not put a price on your health. When we learn of new clinical trial results, we will share.

We do not make claims regarding treatments. We present the information in an unbiased manner and welcome those who disagree to have a conversation based on scientific facts – not a “gut feeling” or because “someone said.”

What Caused Your Cancer? ×



We're glad you've come to Cancer Tutor for answers. We look forward to helping address your needs, to provide information for caregivers, and to be a respected outlet for all health care providers to exchange ideas for the betterment of cancer patients.

You've heard of cancer. Likely there are people in your family who have faced cancer. But what is cancer, really? Until you are faced with reality, cancer is something that happens to someone else. And then, the doctor said three words — “*You have cancer ...*” — that change your life. Immediately your mind began to race: What about my family? What about my job? Why me?

But cancer is not a death sentence.

Among your options are [natural and integrative treatments](#) that have been used to treat the disease. These natural cancer treatments have been documented to be helpful and can be less expensive than traditional chemotherapy, radiation, and surgery.

Before you begin treating cancer, you need to understand what caused your cancer. Then you can approach treatment with a solid understanding and confidence.

What Caused Your Cancer? ×



? Did You Know

Why is treating cancer so hard?

The cellular and genetic description of cancer is only part of the story. In fact, it is a simplistic argument that has shaped the cancer therapy industry for decades — arguably, in the wrong direction. Thinking of cancer as a genetic anomaly allows the logical conclusion that targeting the anomalous cells can eliminate cancer. That thinking has proved fallacious over time. It is not just that it is difficult to therapeutically differentiate between the cancerous and

non-cancerous cells. Scientific evidence today points to a much more complex environment that regulates the growth of cancer that must be tackled to ensure lasting results against the disease.

To truly understand cancer, you have to first know that cancer cannot exist in isolation — it exists and grows in the environment that we know as the body. Everything we do to the body can have a positive or negative effect on the growth of cancer. Cancer creates its own micro-environment, and the increasingly altered environment then feeds back cancer.

At the core of cancer lies a single word: intelligence. Cancer cells are intelligent. It is a proven fact that they can rapidly recruit healthy cells to create large masses that we know as tumors. It is also known now that obliterating large tumor masses can and usually does leave behind cancer stem cells that carry within them the entire information needed to replicate tumors. The resulting tumors tend to be more aggressive and resistant to therapy.

That is why to truly treat cancer, we have to look past killing the cancer cell. We must be able to modify the environment that provides the “fertile soil” for its growth so it is increasingly difficult to set root. We must re-energize the immune system so that it does not remain an ineffective, silent bystander while cancer grows. The body has all the information it needs to beat cancer — it has been doing this task from the day each of us was born. Somewhere along the way, our body’s defenses get overwhelmed. That is why knowing how to restore the body’s ability to defend itself becomes a central theme in holistic cancer medicine.

What Caused Your Cancer? ×



All cancers begin in cells

So what is cancer? It begins with cells, the basic building blocks of the body. There are many different types of cells, and they make up all of the

tissues and organs in the body. Within each cell are thousands of genes that act as a command center for the cell. Genes provide instructions for what role the cell will play in the body. Each gene has a unique job to perform either by itself or in combination with other genes.

Otto Warburg discovered that the flavins and the nicotinamide were the active groups of the hydrogen transferring enzymes. This, together with the iron-oxygenase discovered earlier, gave a complete account of the oxidations and reductions in the living world. The discovery opened up new ways in the fields of cellular metabolism and cellular respiration. He showed, among other things, that cancerous cells can live and develop even in the absence of oxygen.

“[Warburg] determined the definition of a cancer cell is one with low adenosine triphosphate,” Cancer Tutor founder Webster Kehr said. “Every cell in your body creates an enormous amount of ATP every second; the ATP is the energy of the cell. The definition of a cancer cell is that something is blocking the creation of ATP energy in the cell.”

Cells divide to make new cells and replace damaged or old cells. As cells duplicate, they pass along copies of their genetic material to the new cells.

What Caused Your Cancer? ×



The process of cells dividing and passing along genes is usually well controlled, ensuring that the right kinds and numbers of cells are present for the different parts of the body to function correctly. The body and the cells can usually recognize when something has changed in a cell and will work to repair or destroy the abnormal cell.

Cancer is the uncontrolled growth of abnormal cells in the body. Cancer develops when the body's normal control mechanism stops working. Old cells do not die and cells grow out of control, forming new abnormal cells. These cells may form a mass of tissue — a tumor. (However, some cancers, such as leukemia, do not form tumors.)

All cancers begin in cells. [Cancer starts with changes](#) in one cell or a small group of cells. Usually, we have just the right number of each type of cell.

This is because cells produce signals to control how much and how often the cells divide. If any of these signals are faulty or missing, cells may start to grow and multiply too much and form a lump (tumor). Where cancer starts is called the primary tumor.

Gene mutations are cellular

For cancer to start, certain changes take place within the genes of a cell or a group of cells.

Different types of cells in the body do different jobs, but they are basically similar. They all have a control center called a nucleus. Inside the nucleus are chromosomes made up of long strings of DNA (deoxyribonucleic acid). DNA contains thousands of genes, which are coded messages that tell the cell how to behave.

Each gene is an instruction that tells the cell to make something. This could be a protein or a different type of molecule called RNA (ribonucleic acid). Together, proteins and RNA control the cell. They decide what sort of cell it will be, what it does, when it will divide.

What Caused Your Cancer? ×



Normally genes make sure that cells grow and reproduce in an orderly and controlled way. They make sure that more cells are produced as needed to keep the body healthy.

Sometimes a change happens in the genes when a cell divides. The change is called a mutation. It means that a gene has been damaged or lost or copied twice. Mutations also can happen by chance when a cell is dividing. Some mutations mean that the cell no longer understands its instructions and starts to grow out of control.

Mutations in particular genes may mean that too many proteins have been produced and trigger a cell to divide. Or proteins that normally tell a cell to stop dividing may not be produced.

Some genes get damaged every day, and cells repair them. But over time, the damage may build up. Once cells start growing too fast, they are more likely to pick up further mutations and less likely to be able to repair the damaged genes.

Most common forms of cancer

While trying to get your head around “what is cancer,” understand that it can occur anywhere in the body. In women, breast cancer is most common. In men, it’s prostate cancer. Lung cancer and colorectal cancer affect both men and women in high numbers.

There are five main categories of cancer:

Carcinomas begin in the skin or tissues that line the internal organs and are the most common type of cancer. They are formed by epithelial cells, which are the cells that cover the inside and outside surfaces of the body. There are many types of epithelial cells, which often have a column-like shape when viewed under a microscope.

Sarcomas develop in the bone, cartilage, fat, tissues. These are cancers that form in bone and soft tissues, including muscle, fat, blood vessels, lymph vessels, and fibrous tissue (such as tendons and ligaments).

What Caused Your Cancer? ×



Leukemia begins in the blood and bone marrow. These cancers do not form solid tumors. Instead, large numbers of abnormal white blood cells (leukemia cells and leukemic blast cells) build up in the blood and bone marrow, crowding out normal blood cells. The low level of normal blood cells can make it harder for the body to get oxygen to its tissues, control bleeding, or fight infections.

There are four common types of leukemia, which are grouped based on how quickly the disease gets worse (acute or chronic) and on the type of blood cell cancer starts in (lymphoblastic or myeloid).

Lymphomas start in the immune system. This cancer begins in lymphocytes (T cells or B cells). These are disease-fighting white blood cells that are part of the immune system. In lymphoma, abnormal lymphocytes build up in lymph nodes and lymph vessels, as well as in other organs of the body.

Melanoma is cancer that begins in cells that become melanocytes, which are specialized cells that make melanin (the pigment that gives skin its color). Most melanomas form on the skin, but melanomas can also form in other pigmented tissues, such as the eye.

In all types of cancer, some of the body's cells begin to divide without stopping and spread into surrounding tissues.

? Did You Know

Most cancers have four stages:

Stage I usually means that a cancer is relatively small and contained within the organ it started in.

Stage II usually means cancer has not started to spread into surrounding tissue but the tumor is larger than in Stage I. Sometimes Stage II means that cancer cells have spread to lymph nodes close to the tumor, depending on the type of cancer.

Stage III usually means the cancer is larger. It may have started to spread into surrounding tissues and there are cancer cells in the lymph nodes in the area.

Stage IV means cancer has spread from where it started to another body organ. This is also called secondary or metastatic cancer.

Sometimes doctors use the letters A, B, or C to further divide the number categories — for example, stage 3B cervical cancer.

More about common cancers

Carcinomas that begin in different epithelial cell types have specific names:

- **Adenocarcinoma** is cancer that forms in epithelial cells that produce fluids or mucus. Tissues with this type of epithelial cell are sometimes called glandular tissues. Most cancers of the breast, colon, and prostate are adenocarcinomas.
- **Basal cell carcinoma** is cancer that begins in the lower or basal (base) layer of the epidermis, which is a person's outer layer of skin. Squamous cell carcinoma is cancer that forms in squamous cells, which are epithelial cells that lie just beneath the outer surface of the skin. Squamous cells also line many other organs, including the stomach, intestines, lungs, bladder, and kidneys.
- **Squamous cells** look flat, like fish scales, when viewed under a microscope. Squamous cell carcinomas are sometimes called epidermoid carcinomas.
- **Transitional cell carcinoma** is cancer that forms in a type of epithelial tissue called transitional epithelium, or urothelium. This tissue, which is made up of many layers of epithelial cells that can get bigger and smaller, is found in the linings of the bladder, ureters, and part of the kidneys (renal pelvis), and a few other organs. Some cancers of the bladder, ureters, and kidneys are transitional cell carcinomas.

Osteosarcoma is the most common cancer of bones. The most common types of soft tissue sarcoma are leiomyosarcoma, Kaposi sarcoma, malignant fibrous histiocytoma, liposarcoma, and dermatofibrosarcoma protuberans.

Leukemias begin when large numbers of abnormal white blood cells (leukemia cells and leukemic blast cells) build up in the blood and bone marrow, crowding out normal blood cells. The low level of normal blood cells can make it harder for the body to get oxygen to its tissues, control bleeding, or fight infections.

There are two main types of lymphoma:

- **Hodgkin lymphoma** — People with this disease have abnormal lymphocytes that are called Reed-Sternberg cells. These cells usually form from B cells.
- **Non-Hodgkin lymphoma** — This is a large group of cancers that start in lymphocytes. The cancers can grow quickly or slowly and can form from B cells or T cells.

Multiple myelomas are cancer that begins in plasma cells, another type of immune cell. The abnormal plasma cells, called myeloma cells, build up in the bone marrow and form tumors in bones all through the body. Multiple myelomas also are called plasma cell myeloma and Kahler disease.

Also, central nervous system cancers develop in the brain and spinal cord. There are different types of brain and spinal cord tumors. These tumors are named based on the type of cell in which they formed and where the tumor first formed in the central nervous system. For example, an astrocytic tumor begins in star-shaped brain cells called astrocytes, which help keep nerve cells healthy. Brain tumors can be benign (not cancer) or malignant (cancer).

Malignant vs. benign tumors

Cancerous tumors are malignant, which means they can spread into nearby tissues. As these tumors grow, some cancer cells can break off and travel through the blood or the lymph system to other places in the body and form new tumors far from the original tumor.

Unlike malignant tumors, benign tumors do not spread into nearby tissues. Benign tumors can sometimes be quite large. When removed, they usually don't grow back, whereas malignant tumors sometimes do. Unlike most benign tumors elsewhere in the body, benign brain tumors can be life-threatening.

Cancer cells are also often able to evade the immune system, a network of organs, tissues, and specialized cells that protect the body from infections and other conditions. Although the immune system normally removes damaged or abnormal cells from the body, some cancer cells are able to "hide" from the immune system.

Tumors also can use the immune system to stay alive and grow. For example, with the help of certain immune system cells that normally prevent a runaway immune response, cancer cells can actually keep the immune system from killing cancer cells.

To start with, cancer cells are contained within the body tissue from which they have developed — the lining of the bladder or breast ducts. Doctors call this superficial cancer growth. It may also be called *carcinoma in situ*.

The cancer cells grow and divide to create more cells and will eventually form a tumor. A tumor may contain millions of cells. All body tissues have a layer keeping the cells of that tissue inside called the basement membrane. Once the cancer cells have broken through the basement membrane it is called invasive cancer.

As the tumor gets bigger, the center of it gets further and further away from the blood vessels in the area where it is growing. So the center of the tumor gets less and less of the oxygen and the other nutrients all cells need to survive.

Like healthy cells, cancer cells cannot live without oxygen and nutrients. So they send out signals, called angiogenic factors, that encourage new blood vessels to grow into the tumor. This is called angiogenesis. Without a blood supply, a tumor can't grow much bigger than a pinhead.

Once cancer can stimulate blood vessel growth, it can grow bigger and grow more quickly. It will stimulate the growth of hundreds of new capillaries from the nearby blood vessels to bring it nutrients and oxygen.

As a tumor gets bigger, it takes up more room in the body. Cancer can then cause pressure on surrounding structures. It can also grow directly into body structures nearby. This is called a local invasion. How cancer actually grows into surrounding normal body tissues is not fully understood.

? Did You Know

Tumors can be benign (non-cancerous) or malignant (cancerous).

Benign tumors

- Usually grow quite slowly;
- Don't spread to other parts of the body;
- Usually have a covering made up of normal cells,

Benign tumors are made up of cells that are quite similar to normal cells. They will only cause a problem if they

- Grow very large;
- Become uncomfortable or unsightly;
- Press on other body organs;
- Take up space inside the skull (such as a brain tumor);
- Release hormones that affect how the body works.

Malignant tumors

- Are made up of cancer cells;
- Usually grow faster than benign tumors;
- Spread into and damage surrounding tissues;
- May spread to other parts of the body in the bloodstream or through the lymph system to form secondary tumors. Spreading to other parts of the body is called [metastasis](#).

The spread of cancer

Cancer may just grow out in a random direction from the place where it started. However, tumors can spread into some tissues more easily than others. For example, large blood vessels that have very strong walls and dense tissues such as cartilage are hard for tumors to grow into. So locally, tumors may grow along the path of least resistance — they take the easiest route.

The place where cancer starts in the body is called primary cancer or primary site. If cancer cells spread to another part of the body the new area of cancer is called secondary cancer or a metastasis. Some cancers may spread to more than one area of the body to form multiple secondaries or metastases.

If the cancer cells go into small blood vessels they can then get into the bloodstream. They are called circulating tumor cells.

Researchers are currently looking at using blood tests to find circulating tumor cells to diagnose cancer and avoid the need for tests such as biopsies. They also are looking at whether they can test circulating cancer cells to predict which treatments will work best for each patient.

The circulating blood sweeps the cancer cells along until they get stuck somewhere. Usually, they get stuck in a very small blood vessel called a capillary. Then the cell must move through the wall of the capillary and into the tissue of the organ close by. The cell can multiply to form a new tumor if the conditions are right for it to grow and it has the nutrients that it needs.

Out of many thousands of cancer cells that reach the blood circulation, only a few will survive to form secondary cancer (metastasis).

Some cancer cells are probably killed off by the white blood cells in our immune system. Other cancer cells may die because they are battered around by the fast-flowing blood.

Cancer cells in the circulation may try to stick to platelets to form clumps to give themselves some protection. Platelets are blood cells that help the blood to clot. This may also help the cancer cells to be filtered out in the next capillary network they come across so they can then move into the surrounding tissues.

Cancer and the lymphatic system

The lymphatic system is a network of tubes and glands in the body that filters body fluid and fights infection. It also traps damaged or harmful cells such as cancer cells.

If cancer cells go into the small lymph vessels close to the primary tumor they can be carried into nearby lymph glands. The cancer cells may get stuck there. In the lymph glands, they may be destroyed but some may survive and grow to form tumors in one or more lymph nodes. Doctors call this lymph node spread.

Micrometastases are areas of cancer spread (metastases) that are too small to see. Some areas of cancer cells are too small to show up on any type of scan. For most cancers, the doctor can only say whether it is likely or not that a patient has micrometastases.

For a few types of cancer, blood tests can detect certain proteins released by the cancer cells. These may give a sign that there are metastases in the body that are too small to show up on a scan. But for most cancers, there is no blood test that can say whether cancer has spread or not.

So what is cancer?

Cancer is a group of more than 100 different diseases, and it can develop almost anywhere in the body. As a cancerous tumor grows, the bloodstream or lymphatic system may carry cancer cells to other parts of

the body. During this process, known as metastasis, the cancer cells grow and may develop into new tumors.

One of the first places cancer often spreads is to the lymph nodes — tiny, bean-shaped organs that help fight infection. They are located in clusters in different parts of the body, such as the neck, groin area, and under the arms.

Cancer also may spread through the bloodstream, to the bones, liver, lungs, or brain. Even if cancer spreads, it is still named after the area where it began. For example, if breast cancer spreads to the lungs, it is called metastatic breast cancer, not lung cancer.

Often, a diagnosis begins when a person visits a doctor about an unusual symptom. The doctor will talk with the person about his or her medical history and symptoms. Then the doctor will perform various tests to find out the cause of these symptoms. Many people with cancer have no symptoms, though. For these people, cancer is diagnosed during a medical test for another issue or condition.

Sometimes a doctor diagnoses cancer after a screening test in an otherwise healthy person. Examples of screening tests include colonoscopy, mammography, and a Pap test. A person may need additional tests to confirm the result of the screening test.

For most cancers, a biopsy is the only way to make a definite diagnosis. A biopsy is the removal of a small amount of tissue for further study. After a biopsy, your health care team completes several steps before the pathologist makes a diagnosis. A pathologist is a doctor who specializes in interpreting laboratory tests and evaluating cells, tissues, and organs to diagnose disease.

Additional sources: National Cancer Institute, Cancer Research UK, American Institute for Cancer Research