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MetastasisFast and slow cancersStagesTumorsTreatmentTakeawayOur bodies are made up trillions of cells. Normally, new cells replace old or damaged cells as they die off.Sometimes, a cell’s DNA becomes damaged. The immune system can generally control a small number of abnormal cells from further damage to our bodies.Cancer occurs when there are more abnormal cells than the immune system can handle. Instead of dying, abnormal cells continue to grow and divide, piling up in the form of tumors. Eventually, that out-of-control growth causes the abnormal cells to invade surrounding tissues.There are more than 100 types of cancer named for the tissues or organs where they originate. All have the ability to spread, but some are more aggressive than others.Continue reading to learn how cancer spreads, how it’s staged, and how various treatments work.Cancer cells don’t respond to signals telling them it’s time to die, so they continue rapidly dividing and multiplying. And they’re very good at hiding from the immune system. When cancer cells are still contained in the tissue where they developed, it’s called carcinoma in situ (CIS). Once those cells break outside the tissue’s membrane, it’s called invasive cancer.The spread of cancer from where it started to another place is called metastasis. No matter where else in the body it spreads, a cancer is still named for the place it originated. For instance, prostate cancer that has spread to the liver is still prostate cancer, not liver cancer, and treatment will reflect that.While solid tumors are a feature of many types of cancer, that’s not always the case. For example, leukemias are cancers of the blood that doctors refer to as “liquid tumors.”Exactly where cancer cells will spread next is dependent on their location in the body, but it’s likely to spread nearby first. Cancer can spread through:Tissue. A growing tumor can push through surrounding tissues or into organs. Cancer cells from the primary tumor can break away and form new tumors nearby.The lymph system. Cancer cells from the tumor can enter nearby lymph nodes. From there, they can travel the entire lymph system and start new tumors in other parts of the body.The bloodstream. Solid tumors need oxygen and other nutrients to grow. Through a process called angiogenesis, tumors can prompt the formation of new blood vessels to ensure their survival. Cells can also enter the bloodstream and travel to distant sites.Cancer cells that have more genetic damage (poorly differentiated) usually grow faster than cancer cells with less genetic damage (well differentiated). Based on how abnormal they appear under a microscope, tumors are graded as follows:GX: undeterminedG1: well-differentiated or low-gradeG2: moderately differentiated or intermediate-gradeG3: poorly differentiated or high-gradeG4: undifferentiated or high-gradeSome cancers that are generally slower growing are:Some cancers, such as prostate cancer, can grow so slowly that your doctor may recommend a “watchful waiting” approach rather than immediate treatment. Some may never require treatment.Examples of fast-growing cancers include:Having a fast-growing cancer doesn’t necessarily mean you have a poor prognosis. Many of these cancers can be effectively treated. And some cancers don’t necessarily grow faster, but are less likely to be detected until they have metastasized.Cancers are staged according to tumor size and how far it has spread at the time of diagnosis. Stages help doctors decide which treatments are most likely to work and give a general outlook. There are different types of staging systems and some are specific to certain types of cancer. The following are the basic stages of cancer:In situ. Precancerous cells have been found, but they haven’t spread to surrounding tissue.Localized. Cancerous cells haven’t spread beyond where they started.Regional. Cancer has spread to nearby lymph nodes, tissues, or organs.Distant. Cancer has reached distant organs or tissues.Unknown. There’s not enough information to determine the stage.Stage 0 or CIS. Abnormal cells have been found but have not spread into surrounding tissue. This is also called precancer.Stages 1, 2, and 3. The diagnosis of cancer is confirmed. The numbers represent how large the primary tumor has grown and how far the cancer has spread. Stage 4. 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Benign tumors can cause a few problems if they:are large enough to press on organs, cause pain, or are visually bothersomeare located in the brainrelease hormones that affect body systemsBenign tumors can usually be surgically removed and are unlikely to grow back.Cancerous tumors are called malignant. Cancer cells form when DNA abnormalities cause a gene to behave differently than it should. They can grow into nearby tissue, spread through the bloodstream or lymph system, and spread through the body. Malignant tumors tend to grow faster than benign tumors.Generally speaking, it’s easier to treat cancer before it has the chance to spread. Treatment depends on the specific type of cancer as well as the stage. In many cases, treatment will consist of more than one therapy.Depending on the type of cancer you have, surgery may be the first-line treatment. When surgery is used to remove a tumor, the surgeon also removes a small margin of tissue around the tumor to lower the chances of leaving cancer cells behind. Surgery can also help stage the cancer. For example, checking the lymph nodes near the primary tumor can determine if cancer has spread locally.You may also need chemotherapy or radiation therapy following surgery. This may be an added precaution in case any cancer cells were left behind or have reached the blood or lymph system.If a tumor can’t be completely removed, your surgeon may still remove part of it. This can be helpful if the tumor was causing pressure on an organ or causing pain.Radiation uses high-energy rays to kill cancer cells or slow their growth. The rays target a specific area of the body where cancer has been found. Radiation can be used to destroy a tumor or to relieve pain. It can also be used after surgery to target any cancer cells that may have been left behind.Chemotherapy is a systemic treatment. Chemo drugs enter your bloodstream and travel throughout your body to find and destroy rapidly dividing cells. Chemotherapy is used to kill cancer, slow its growth, and reduce the chance that new tumors will form. It’s useful when cancer has spread beyond the primary tumor or if you have a type of cancer for which there are no targeted therapies.Targeted therapies depend on the specific type of cancer, but not all cancers have targeted therapies. These drugs attack specific proteins that allow tumors to grow and spread. Angiogenesis inhibitors interfere with the signals that allow tumors to form new blood vessels and continue growing. These medicines can also cause already existing blood vessels to die, which can shrink the tumor. Some types of cancer, like prostate and most breast cancers, need hormones to grow. Hormone therapy can stop your body from producing the hormones that feed the cancer. Others stop those hormones from interacting with cancer cells. Hormone therapy also helps to prevent recurrence.Immunotherapies boost the power of your own body to fight cancer. These drugs can strengthen your immune system and help it recognize cancer cells. A stem cell transplant, sometimes called bone marrow transplant, replaces damaged blood-forming cells with healthy ones. The procedure takes place following large-dose chemotherapy or radiation therapy to kill cancer cells and to stop your stem cells from producing cancerous cells. Stem cell transplants can be used for several types of cancer, including multiple myeloma and some kinds of leukemia.Cancer isn’t a single disease. There are many types — and subtypes — of cancer. Some are more aggressive than others, but there are many variables that lead to different cancer characteristics. Your oncologist can give you a better understanding of the typical behavior of a certain kind of cancer based on the specifics of your pathology report. Cancer cells are notorious for their ability to divide uncontrollably and generate hordes of new tumor cells. Most of the fuel consumed by these rapidly proliferating cells is glucose, a type of sugar.Scientists had believed that most of the cell mass that makes up new cells, including cancer cells, comes from that glucose. However, MIT biologists have now found, to their surprise, that the largest source for new cell material is amino acids, which cells consume in much smaller quantities.The findings offer a new way to look at cancer cell metabolism, a field of research that scientists hope will yield new drugs that cut off cancer cells’ ability to grow and divide.“If you want to successfully target cancer metabolism, you need to understand something about how different pathways are being used to actually make mass,” says Matthew Vander Heiden, the Eisen and Chang Career Development Professor and an associate professor in the Department of Biology, and a member of MIT’s Koch Institute for Integrative Cancer Research.Vander Heiden is the senior author of the study, which appears in the journal Developmental Cell on March 7. The paper’s lead author is MIT graduate student Aaron Hosios.Burning upSince the 1920s, scientists have known that cancer cells generate energy differently than normal cells, a phenomenon dubbed the “Warburg effect” after its discoverer, German biochemist Otto Warburg. Human cells normally use glucose as an energy source, breaking it down through a series of complex chemical reactions that requires oxygen. Warburg discovered that tumor cells switch to a less efficient metabolic strategy known as fermentation, which does not require oxygen and produces much less energy.More recently, scientists have theorized that cancer cells use this alternative pathway to create building blocks for new cells. However, one strike against this hypothesis is that much of the glucose is converted into lactate, a waste product that is not useful to cells. Furthermore, there has been very little research on exactly what goes into the composition of new cancer cells or any kind of rapidly dividing mammalian cells.“Because mammals eat such a diversity of foods, it seemed like an unanswered question about which foods contribute to what parts of mass,” Vander Heiden says.To determine where cells, including those in tumors, were getting the building blocks they needed, the researchers grew several different types of cancer cells and normal cells in culture dishes. They fed the cells different nutrients labeled with variant forms of carbon and nitrogen, allowing them to track where the original molecules ended up. They also weighed the cells before and after they divided, enabling them to calculate the percentage of cell mass contributed by each of the available nutrients.Although cells consume glucose and the amino acid glutamine at very high rates, the researchers found that those two molecules contribute little to the mass of new cells — glucose accounts for 10 to 15 percent of the carbon found in the cells, while glutamine contributes about 10 percent of the carbon. Instead, the largest contributors to cell mass were amino acids, which make up proteins. As a group, amino acids (excluding glutamine) contribute the majority of the carbon atoms found in new cells and 20 to 40 percent of the total mass.“These experiments reveal important details that reinforce our fundamental understanding of the metabolic underpinnings of molecular biosynthesis and cellular proliferation,” says Jared Rutter, a professor of biochemistry at the University of Utah who was not involved in the research. “The MIT team has performed a rigorous and quantitative assessment of the contributions of glucose, glutamine, and other molecules to the mass of proliferating mammalian cells in culture.”Although initially surprising, the findings make sense, Vander Heiden says, because cells are made mostly of protein.“There’s some economy in utilizing the simpler, more direct route to build what you’re made out of,” he says. “If you want to build a house out of bricks, it’s easier if you have a pile of bricks around and use those bricks than to start with mud and make new bricks.”Refocusing the questionIt remains something of a mystery why proliferating human cells consume so much glucose. Consistent with previous studies, the researchers found that most of the glucose burned by these cells is excreted as lactate.“This led us to conclude that the importance of high glucose consumption is not necessarily the manipulation of carbon that allows you to make cell mass, but more for the other products that it provides, such as energy,” Hosios says.Vander Heiden’s lab is now pursuing a more comprehensive understanding of how the Warburg effect may help cells reproduce. “It refocuses the question,” he says. “It isn’t necessarily about how the Warburg effect helps cells put glucose into cell mass, but more about why does glucose-to-lactate conversion help cells use amino acids to build more cells.”Other authors of the paper include Vivian Hecht, a former MIT graduate student; Laura Danai, a Koch Institute postdoc; Scott Manalis, the Andrew (1956) and Erna Viterbi Professor in the MIT departments of Biological Engineering and Mechanical Engineering and a member of the Koch Institute; Jeffrey Rathmell, a professor at Vanderbilt University School of Medicine; Marc Johnson, a Vanderbilt University postdoc; and Matthew Steinhauser, an assistant professor of medicine at Harvard Medical School and Brigham and Women’s Hospital.The research was funded by the National Institutes of Health, the Burroughs Wellcome Fund, and the Damon Runyon Cancer Research Foundation. 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According to Professor Trevor Graham, a Cancer Research UK-funded cancer evolution expert, the best evidence for the fact that most cancers grow slowly comes from screening. The screening programmes we have in the UK work “because there’s a long period of time when a tumour may have started to develop but it’s not become dangerous yet”, he says. Take bowel screening for example. For every cancer that’s picked up during bowel cancer screening, 4 early tumours called adenomas are detected. Although most will never go on to become cancer, some will. “It seems that tumour growth is started in lots of people, but it never quite makes it to the cancer stage,” says Graham. “That really points to growth often being slow.” And this doesn’t just apply to bowel cancer. Similar trends are seen in breast cancer, where 1 in 4 breast cancers picked up during screening would never have caused any problems, which points to them being slow growing. And even with cancers that often seem to be fast growing and aggressive, such as pancreatic cancer, Graham says this could just be down to the point at which they’re detected. “We think that pancreatic cancers are often detected quite late, so they’ve been growing and evolving for a while. There might be a long and fairly slow development phase, but the first part is just invisible to us,” he says. But like all good rules of thumb, there are exceptions. Graham works with people with inflammatory bowel disease, who have a higher risk of bowel cancer and are offered more regular bowel screening. This gives researchers a better idea of when tumours have begun to grow. “Around 1 in 6 cancers develop in the 3 years between screens,” he says. “They won’t be there the first time we test, but they’ll develop before the second time. So they’ve developed relatively quickly.” The question then becomes: what decides how quickly a tumour develops? Turning back the clock There’s a crucial set of ingredients needed for a cell to turn cancerous, which we’ve blogged about before. A cell accumulates mistakes in its DNA, which cause a gene or a set of genes to go awry. And because cells have safety mechanisms that work to stop cells growing and dividing more than they should, multiple faults need to appear before a cell tips over the edge and becomes cancerous. How quickly these faults appear, and what types of faults appear, could help to determine how fast a tumour develops. Cancer Research UK-funded scientists have found that kidney cancer generally fall into one of 3 categories, based on the amount, type and variety of genetic damage the cancer cells have. And this is linked to how the cancers behave. Some kidney cancers don’t have much genetic damage, producing slow-growing tumours that are unlikely to spread. At the other end of the spectrum were the aggressive, fast-growing tumours, which typically have lots of genetic changes inside the cells that push them to grow quickly and spread early on in their development. Reading a cancer’s DNA can help us to understand when it started to develop. By reading a cancer’s DNA, scientists can wind back the clock to its beginnings. “Scientists can estimate how old cancers are using something called the ‘molecular clock’,” says Graham. “They can estimate how often random DNA faults occur and then compare that with how many faults are found in a particular tumour – and that can give them an estimate of how old the tumour is.” Scientists have found that for most breast and bowel cancers, the tumours begin to grow around ten years before they’re detected. And for prostate cancer, tumours can be many decades old. “They’ve estimated that one tumour was 40 years old. Sometimes the growth can be really slow,” says Graham. So what can we do with this information? Knowledge is power For Graham, studying cancers’ clocks could help diagnose more tumours earlier. “If we know how long a tumour takes to develop and when it’s likely to begin, then we know when to start looking in people for early signs of cancer. It could help us to design better screening programmes.” This type of research could also help to personalise treatment. Using a cancer’s DNA code to predict how it might behave would give doctors an opportunity to tailor each person’s treatment. And also decide when treatment isn’t necessary. We’re not there yet, but Graham’s team are working to make predictions like these a reality. “It would help us to get diagnosis and treatment right and reduce the number of people whose cancers aren’t treated aggressively enough. But, equally as important, it would reduce the number of people who are overdiagnosed and overtreated for a slow-growing cancer that would never cause harm.” Katie We’d like to thank Kathryn for asking this question. If you’d like to ask us something, post a comment below or email with your question and first name. This page tells you about how cancers grow. There is information aboutTumours (lumps) can be benign or cancerous (malignant). Benign means it is not cancer.Benign tumours are made up of cells that are quite similar to normal cells. They only cause a problem if they:To start with, cancer cells stay inside the body tissue from which they have developed. For example, the lining of the bladder or the breast ducts. Doctors call this superficial cancer growth or carcinoma in situ (CIS). The cancer cells grow and divide to create more cells and will eventually form a tumour. A tumour may contain millions of cancer cells.All body tissues have a layer (a membrane) that keeps the cells of that tissue inside. This is the basement membrane. Cancer cells can break through this membrane. The cancer is called invasive cancer if it breaks through this membrane. As the tumour gets bigger, its centre gets further and further away from the blood vessels in the area where it is growing. So the centre of the tumour gets less and less oxygen and nutrients. Like healthy cells, cancer cells can't live without oxygen and nutrients. So they send out signals called angiogenic factors. These encourage new blood vessels to grow into the tumour. This is called angiogenesis. Without a blood supply, a tumour can't grow much bigger than a pin head. Once a cancer can stimulate blood vessel growth, it can grow bigger. It stimulates hundreds of new small blood vessels (capillaries): to grow to bring in nutrients and oxygen This 1 minute video explains how cancer gets a blood supply. You can view a transcript of the video. There is a lot of research looking at angiogenesis. We know from research so far that the amount of angiogenic factors is very high at the outer edges of a cancer. Some cancer drugs can stop cancers from growing their own blood vessels. These drugs are called anti angiogenic drugs. They can't get rid of a cancer but might be able to shrink it or stop it growing. More of these drugs are being developed and tested all the time. Read about drugs that block blood vessel growth Find out about trials that are looking at anti angiogenic drugs on our clinical trials database How cancer spreads into surrounding tissues As a tumour gets bigger, it takes up more space in the body. The cancer can: press on surrounding structures grow into body structures nearby This is called local invasion. Researchers don't fully understand how cancer grows into the surrounding tissues A cancer might grow out in a random direction from where it started. We know from research that tumours can spread into some tissues more easily than others. For example, large blood vessels that have strong walls and dense tissues such as cartilage are hard for tumours to grow into. So, tumours tend to grow along the 'path of least resistance'. This means that they probably take the easiest route. We know from research that there are 3 different ways that tumours may grow into surrounding tissues. A tumour probably uses all 3 of these ways of spreading. The way it uses most depends on: the type of tumour where the cancer is growing in the body The 3 ways that tumours may grow into surrounding tissues are: pressure from the growing tumour using enzymes cancer cells moving through the tissue Pressure from the growing tumour As the tumour grows and takes up more space, it begins to press on the normal body tissue nearby. The tumour growth will force itself through the normal tissue, as in the diagram below. The growth has a finger like appearance. This happens because it is easier for the cancer to force its way through some paths than others. For example, cancers may grow between sheets of muscle tissue rather than straight through the muscle. As the cancer grows, it squeezes and blocks small blood vessels in the area. Low blood and oxygen levels cause some of the normal tissue to die off. This makes it easier for the cancer to continue to push its way through. Using enzymes Some normal cells produce chemicals called enzymes. These break down cells and tissues. The cells use the enzymes to: attack invading bacteria and viruses break down and clear up damaged areas in the body This is all part of the natural healing process. Many cancers contain: larger amounts of these enzymes a lot of normal white blood cells, which produce the enzymes They are part of the body's immune response to the cancer. Researchers are not yet sure where the enzymes come from. But they think the enzymes make it easier for the cancer to spread through the healthy tissue. As the cancer pushes through and breaks down normal tissues it might cause bleeding. This is because there is damage to nearby blood vessels. Cancer cells moving through the tissue One of the ways that cancer cells are different to normal cells is that it is easier for cancer cells to move about. So one of the ways that cancers spread into nearby tissues is by the cells directly moving. Scientists have discovered a substance made by cancer cells which stimulates them to move. They don't know for sure yet, but it seems that this substance might be involved in the local spread of cancers. This is interesting research. If a substance can help cancer cells move, it means that researchers can look for ways to stop the substance working. They may also be able to find ways to stop the cancer cells making the substance in the first place. Researchers are also trying to understand how cancer cells change shape as they move and spread to other parts of the body. Find out more about how cancer may spread to other parts of the body. Next review due: 9 October 2026 I think you should start with immortalized cell lines and so in vitro division rates by perfect conditions. This is easier to measure than in vivo division rates. E.g. HeLa has a division time of 23 hours. MDA-MB-231 and A549 division times are around 28 hours. So I assume there is a physical barrier somewhere around one division per day or so, and it simply cannot grow faster. While bacterial division times are much lower (down to 20min), they also depend on special mechanisms (see this question/answer) and are orders of magnitude smaller than mammalian cells, so they don't count as a counter argument to this. If you check zygote division times (10-12h, 14-16h, 22-24h, ...), you can see that they highly depend on the cell size. After some divisions the zygote depleted the reserves necessary to divide at higher rates, so after that it is limited by the ~24h barrier too. Time-Lapse Cleavage Rating Pr edicts Human Embryo Viability Same 24h data here by rapidly proliferating cells. The Cell: A Molecular Approach. 2nd edition. So we can assume that 1/24h is the maximum rate of cell division by cancer. Let's read more about cancer in vivo, because it behaves completely different than immortalized cell lines in in vitro tests. Originally tumours were thought to grow because they consisted of cells that multiplied more rapidly than cells in the surrounding tissue. In fact the average cell cycle of 48 hours for human tumour cells is slightly longer than the cycle of non-malignant cells. ... When a normal cell divides, it does os only to replace a cell that has been lost and in this way a constant cell population is maintained. In tumour cells the control mechanism appears to have been lost: as the cell divides it adds to existing numbers of cells and increases the total population. ... A measure of the rate of tumour growth is the time taken for a given population of malignant cells to double in size (doubling time). If the cell cycle takes between 15 and 120 hours, the doubling time can be between 96 hours and 500 days, depending on the histological type of the tumour, its age and whether it is a primary or metastatic growth. A shorter doubling time (less than 30 days) can be between is seen with teratomas, non-Hodgkin's lymphomas, and acute leukaemias; common solid tumours such as squamous cell carcinoma of the bronchus and adenocarcinoma of the breast and bowel have doubling times in excess of 70 days. In the patient the growth of a cacncer is only detectable and observable during the last 10-14 of its 35-40 doubling times. Cancer Nursing: Care in Context (page 270) So according to this book the division rate of cancer cells are similar to healthy cells. According to another book this statement is from Dougherty & Bailey 2001, but I wasn't able to find the scientific article. :S Tumour cells appear to have lost control mechanisms which prevent cells from growing until replacement is required. Human tumour cells are thought to have an average cycle time of 48 hours. This is not more rapid than the cycle of most normal cells. The reason tumours become larger is because their cell division creates additional cells rather than replacements (Dougherty & Bailey 2001). Stoma Care and Rehabilitation MetastasisFast and slow cancersStagesTumorsTreatmentTakeawayOur bodies are made up trillions of cells. Normally, new cells replace old or damaged cells as they die off.Sometimes, a cell’s DNA becomes damaged. The immune system can generally control a small number of abnormal cells from further damage to our bodies.Cancer occurs when there are more abnormal cells than the immune system can handle. Instead of dying, abnormal cells continue to grow and divide, piling up in the form of tumors. Eventually, that out-of-control growth causes the abnormal cells to invade surrounding tissues.There are more than 100 types of cancer named for the tissues or organs where they originate. All have the ability to spread, but some are more aggressive than others.Continue reading to learn how cancer spreads, how it’s staged, and how various treatments work.Cancer cells don’t respond to signals telling them it’s time to die, so they continue rapidly dividing and multiplying. And they’re very good at hiding from the immune system. When cancer cells are still contained in the tissue where they developed, it’s called carcinoma in situ (CIS). Once those cells break outside the tissue’s membrane, it’s called invasive cancer.The spread of cancer from where it started to another place is called metastasis. No matter where else in the body it spreads, a cancer is still named for the place it originated. For instance, prostate cancer that has spread to the liver is still prostate cancer, not liver cancer, and treatment will reflect that.While solid tumors are a feature of many types of cancer, that’s not always the case. For example, leukemias are cancers of the blood that doctors refer to as “liquid tumors.”Exactly where cancer cells will spread next is dependent on their location in the body, but it’s likely to spread nearby first. Cancer can spread through:Tissue. A growing tumor can push through surrounding tissues or into organs. Cancer cells from the primary tumor can break away and form new tumors nearby.The lymph system. Cancer cells from the tumor can enter nearby lymph nodes. From there, they can travel the entire lymph system and start new tumors in other parts of the body.The bloodstream. Solid tumors need oxygen and other nutrients to grow. Through a process called angiogenesis, tumors can prompt the formation of new blood vessels to ensure their survival. Cells can also enter the bloodstream and travel to distant sites.Cancer cells that have more genetic damage (poorly differentiated) usually grow faster than cancer cells with less genetic damage (well differentiated). Based on how abnormal they appear under a microscope, tumors are graded as follows:GX: undeterminedG1: well-differentiated or low-gradeG2: moderately differentiated or intermediate-gradeG3: poorly differentiated or high-gradeG4: undifferentiated or high-gradeSome cancers that are generally slower growing are:Some cancers, such as prostate cancer, can grow so slowly that your doctor may recommend a “watchful waiting” approach rather than immediate treatment. Some may never require treatment.Examples of fast-growing cancers include:Having a fast-growing cancer doesn’t necessarily mean you have a poor prognosis. Many of these cancers can be effectively treated. And some cancers don’t necessarily grow faster, but are less likely to be detected until they have metastasized.Cancers are staged according to tumor size and how far it has spread at the time of diagnosis. Stages help doctors decide which treatments are most likely to work and give a general outlook. There are different types of staging systems and some are specific to certain types of cancer. The following are the basic stages of cancer:In situ. Precancerous cells have been found, but they haven’t spread to surrounding tissue.Localized. Cancerous cells haven’t spread beyond where they started.Regional. Cancer has spread to nearby lymph nodes, tissues, or organs.Distant. Cancer has reached distant organs or tissues.Unknown. There’s not enough information to determine the stage.Stage 0 or CIS. Abnormal cells have been found but have not spread into surrounding tissue. This is also called precancer.Stages 1, 2, and 3. The diagnosis of cancer is confirmed. The numbers represent how large the primary tumor has grown and how far the cancer has spread. Stage 4. Cancer has metastasized to distant parts of the body.Your pathology report may use the TNM staging system, which provides more detailed information as follows:TX: primary tumor can’t be measuredT0: primary tumor can’t be locatedT1, T2, T3, T4: describes the size of the primary tumor and how far it may have grown into surrounding tissueN: Number of regional lymph nodes affected by cancerNX: cancer in nearby lymph nodes can’t be measuredN0: no cancer is found in nearby lymph nodesN1, N2, N3: describes the number and location of lymph nodes affected by cancerM: Whether cancer has metastasized or notMX: metastasis can’t be measuredM0: cancer hasn’t spread to other parts of the bodyM1: cancer has spreadSo, your cancer stage might look something like this: T2N1M0.Benign tumors are noncancerous. They’re covered with normal cells and aren’t able to invade nearby tissue or other organs. Benign tumors can cause a few problems if they:are large enough to press on organs, cause pain, or are visually bothersomeare located in the brainrelease hormones that affect body systemsBenign tumors can usually be surgically removed and are unlikely to grow back.Cancerous tumors are called malignant. Cancer cells form when DNA abnormalities cause a gene to behave differently than it should. They can grow into nearby tissue, spread through the bloodstream or lymph system, and spread through the body. Malignant tumors tend to grow faster than benign tumors.Generally speaking, it’s easier to treat cancer before it has the chance to spread. Treatment depends on the specific type of cancer as well as the stage. In many cases, treatment will consist of more than one therapy.Depending on the type of cancer you have, surgery may be the first-line treatment. When surgery is used to remove a tumor, the surgeon also removes a small margin of tissue around the tumor to lower the chances of leaving cancer cells behind. Surgery can also help stage the cancer. For example, checking the lymph nodes near the primary tumor can determine if cancer has spread locally.You may also need chemotherapy or radiation therapy following surgery. This may be an added precaution in case any cancer cells were left behind or have reached the blood or lymph system.If a tumor can’t be completely removed, your surgeon may still remove part of it. This can be helpful if the tumor was causing pressure on an organ or causing pain.Radiation uses high-energy rays to kill cancer cells or slow their growth. The rays target a specific area of the body where cancer has been found. Radiation can be used to destroy a tumor or to relieve pain. It can also be used after surgery to target any cancer cells that may have been left behind.Chemotherapy is a systemic treatment. Chemo drugs enter your bloodstream and travel throughout your body to find and destroy rapidly dividing cells. Chemotherapy is used to kill cancer, slow its growth, and reduce the chance that new tumors will form. It’s useful when cancer has spread beyond the primary tumor or if you have a type of cancer for which there are no targeted therapies.Targeted therapies depend on the specific type of cancer, but not all cancers have targeted therapies. These drugs attack specific proteins that allow tumors to grow and spread. Angiogenesis inhibitors interfere with the signals that allow tumors to form new blood vessels and continue growing. These medicines can also cause already existing blood vessels to die, which can shrink the tumor. Some types of cancer, like prostate and most breast cancers, need hormones to grow. Hormone therapy can stop your body from producing the hormones that feed the cancer. Others stop those hormones from interacting with cancer cells. Hormone therapy also helps to prevent recurrence.Immunotherapies boost the power of your own body to fight cancer. These drugs can strengthen your immune system and help it recognize cancer cells. A stem cell transplant, sometimes called bone marrow transplant, replaces damaged blood-forming cells with healthy ones. The procedure takes place following large-dose chemotherapy or radiation therapy to kill cancer cells and to stop your stem cells from producing cancerous cells. Stem cell transplants can be used for several types of cancer, including multiple myeloma and some kinds of leukemia.Cancer isn’t a single disease. There are many types — and subtypes — of cancer. Some are more aggressive than others, but there are many variables that lead to different cancer characteristics. Your oncologist can give you a better understanding of the typical behavior of a certain kind of cancer based on the specifics of your pathology report. There is much that we know and much that we have yet to understand. However, we do know that cancer spreads in three important ways: Damaged cells replicate, creating more damaged cells and tumor growth. Our body’s hormones and chemicals can accelerate the growth of some tumors. Lymph and blood vessels can carry the cancer to others areas of the body, and lymph node examination can help pinpoint the progression of the disease. Healthy cells are the basic building blocks of all tissue and organs in the body. But when cell DNA (the cell’s wiring) is damaged, mutated cells begin to rapidly reproduce without following the pre-wired plan. Aggressive cell growth can form a tumor (or mass of tissue) that does not function as originally intended. These abnormal cells or groups of cells can progress into the disease known as breast cancer and can spread to other parts of the body. The growth and spread of breast cancer can be difficult to grasp because cancer cell growth is often fueled by normally healthy chemicals of the body, like estrogen, progesterone, and the HER2/neu gene (a growth hormone). Although each of these three bodily chemicals can serve an important healthy function, when a cell becomes cancerous these chemicals can accelerate the growth of breast cancer tumors. These are known as prognostic factors of the breast cancer cells. Healthy HER2 receptors are the proteins that help manage how a breast cell grows, divides, and repairs itself. However, in about a quarter of all breast cancer patients, the HER2 gene isn’t functioning properly. It makes an excess number of copies of itself in a process known as “HER2 gene amplification.” Then these extra genes instruct the cells to make too many HER2 receptors, which is called “HER2 protein overexpression.” The ultimate result is that breast cells grow and divide in an uncontrolled fashion. Think of a receptor as a mouth. When open, cancer cells can feed and grow. When blocked off or closed, the same cells begin to starve. By identifying the cancer’s unique receptors, your doctor can recommend effective treatment methods to block the receptors. Remember, inhibiting the cancer’s “food supply” works to restrict the cancer’s growth. Ideally, your treatment plan will stop the cancer growth before it spreads through the lymph system and on to other tissue and organs in the body. The lymph system, which is part of the immune system, is a network of lymph vessels and lymph nodes running throughout the entire body. Similar to how the bl