

Cancer

Ma Hongbao ¹, Margaret Young ², Yang Yan ¹

¹ Brookdale Hospital, Brooklyn, New York 11212, USA; ² Cambridge, MA 02138, USA
ma8080@gmail.com

Abstract: Nearly all cancers are caused by abnormalities in the genetic material of the transformed cells. These abnormalities are caused by the effects of carcinogens, such as tobacco smoke, radiation, chemicals, or infectious agents. Tumor (also called neoplasm) is an abnormal growth of tissue. This abnormal growth usually but not always forms a mass growth. The World Health Organization (WHO) classifies neoplasms into four main groups: benign neoplasms, in situ neoplasms, malignant neoplasms, and neoplasms of uncertain or unknown behavior. A malignant neoplasm is a cancer. Cancer is a disease of abnormal cell growth possibly spreading to other parts of the body in animal including human being. Benign tumors are not cancer that do not spread to other parts of the body.

[Ma H, Young M, Yang Y. **Cancer**. Cancer Biology 2014;4(4):59-65]. (ISSN: 2150-1041). <http://www.cancerbio.net>.
9

Key words: DNA; eternal; life; stem cell; universe

1. Introduction

Tumor (also called neoplasm) is an abnormal growth of tissue. This abnormal growth usually but not always forms a mass growth. The World Health Organization (WHO) classifies neoplasms into four main groups: benign neoplasms, in situ neoplasms, malignant neoplasms, and neoplasms of uncertain or unknown behavior. A malignant neoplasm is a cancer.

Cancer is a disease of abnormal cell growth possibly spreading to other parts of the body in animal including human being. Benign tumors are not cancer that do not spread to other parts of the body. There are over 100 different cancers in humans, and the common cancer symptoms are: new lump, bleeding, cough, weight loss, etc. In 2012 about 14.1 million new cases of cancer occurred in the world. It caused about 8.2 million deaths or 14.6% of all human deaths. Deaths from cancer were 5.8 million in 1990. In 2007, the overall costs of cancer in the USA. was estimated to be US dollars \$226.8 billion.

Cancers are classified by the type of tumor cells:

1. Carcinoma: Cancers derived from epithelial cells. This cancer type includes many common cancers, particularly in the aged, and include nearly all those developing in the breast, prostate, lung, pancreas, and colon, etc.
2. Sarcoma: Cancers arising from connective tissue (bone, cartilage, fat, nerve and etc), each of which develop from cells originating in mesenchymal cells outside the bone marrow.
3. Lymphoma and leukemia: These two classes of cancer arise from hematopoietic cells that leave the marrow and tend to mature in the lymph nodes and blood.

4. Germ cell tumor: Cancers derived from pluripotent cells, normally in the testicle or the ovary (seminoma and dysgerminoma, etc).
5. Blastoma: Cancers derived from immature precursor cells or embryonic tissue.

There are more than 100 types of cancer, including breast cancer, skin cancer, lung cancer, colon cancer, prostate cancer, and lymphoma. Symptoms vary depending on the type. Cancer treatment may include chemotherapy, radiation, and/or surgery. Cancer grows out of normal cells in the body.

Cancers are usually named using the organ or tissue of origin as the root. For example, cancers of the liver parenchyma arising from malignant epithelial cells is called hepatocarcinoma, while a malignancy arising from primitive liver precursor cells is called a hepatoblastoma, a cancer arising from fat cells is called a liposarcoma, and breast cancer is called ductal carcinoma of the breast, etc. Benign tumors are named using *-oma* as a suffix with the organ name as the root, such as a benign tumor of smooth muscle cells is called a *leiomyoma*. Some types of cancer are named for the size and shape of the cells under a microscope, such as giant cell carcinoma, spindle cell carcinoma, and small-cell carcinoma, etc.

Malignancy is the tendency of a medical condition to become progressively worse. Malignancy is most familiar as a characterization of cancer. A malignant tumor contrasts with a non-cancerous benign tumor in that a malignancy is not self-limited in its growth, is capable of invading into adjacent tissues, and may be capable of spreading to distant tissues.

Tobacco cause about 22% of cancer deaths, and another 10% is due to obesity, poor diet, lack of

physical activity, and drinking alcohol. Other factors include infections, ionizing radiation and environmental pollutants. The gene mutation is one of the important reason for the cancer. Approximately 10% of cancers are due to genetic defects inherited from parents. The most common types of cancer in males are lung cancer, prostate cancer, colorectal cancer, and stomach cancer, and in females, the most common types are breast cancer, colorectal cancer, lung cancer, and cervical cancer. Cancer can be treated with some combination of radiation therapy, surgery, chemotherapy, and targeted therapy. Local symptoms may occur due to the mass of the tumor or its ulceration. Cancer can spread from its original site by local spread, lymphatic spread and blood, which is called metastasis.

Tobacco smoking, alcohol and obesity are big reason of the cancer. Some specific foods are linked to specific cancers. Some virus can cause cancer (oncovirus), which include human papillomavirus (cervical carcinoma), Epstein-Barr virus (B-cell lymphoproliferative disease and nasopharyngeal carcinoma), Kaposi's sarcoma herpesvirus (Kaposi's sarcoma and primary effusion lymphomas), hepatitis B and hepatitis C viruses (hepatocellular carcinoma), and Human T-cell leukemia virus-1 (T-cell leukemias), etc. Bacterial and parasitic infections are also the reasons of cancer, such as *Helicobacter pylori*-induced gastric carcinoma, *Schistosoma haematobium* (squamous cell carcinoma of the bladder), liver flukes, *Opisthorchis viverrini* and *Clonorchis sinensis* (cholangiocarcinoma), etc. Radiation exposure can cause cancer, including ionizing radiation and non-ionizing ultraviolet radiation. Ionizing radiation is not a strong mutagen. Medical use of ionizing radiation possibly cause cancer. Prolonged exposure to ultraviolet radiation from the sun can lead to melanoma and other skin malignancies.

Renal cell carcinoma is a kidney cancer that originates in the lining of the proximal convoluted tubule. Renal cell carcinoma is the most common type of kidney cancer. Initial treatment is most commonly either partial or complete removal of the affected kidney(s) and remains the mainstay of curative treatment. It is relatively resistant to radiation therapy and chemotherapy. The initial symptoms of renal cell carcinoma include: blood in the urine, flank pain, a mass in the abdomen or flank, weight loss, fever, high blood pressure, night sweats and generally feeling unwell, etc. Renal cell carcinoma is also associated with a number of paraneoplastic syndromes which are conditions caused by either the hormones produced by the tumour or by the body's attack on the tumour. When renal cell carcinoma metastasises it most commonly spreads to the lymph nodes, lungs, liver, adrenal glands, brain and bones, etc. The tumour

arises from the cells of the proximal renal tubular epithelium. It is considered an adenocarcinoma. There are two subtypes: sporadic (that is, non-hereditary) and hereditary. Both such subtypes are associated with mutations in the short-arm of chromosome 3, with the implicated genes being either tumour suppressor genes (VHL and TSC) or oncogenes (like c-Met). The presence of blood in urine is a common presumptive sign of renal cell carcinoma. The haemoglobin of the blood causes the urine to be rusty, brown or red in colour. Alternatively, urinalysis can test for sugar, protein and bacteria which can also serve as indicators for cancer. A complete blood cell count can also provide additional information regarding the severity and spreading of the cancer. (Wikipedia, 2014).

Bladder cancer symptoms include painless blood in the urine or frequent and painful urination. Bladder cancer is highly treatable with options such as surgery, chemotherapy and radiation. Bladder cancer is the rapid, uncontrolled growth of abnormal cells in the bladder. Cancer usually begins in the lining of the bladder. The cancerous cells may spread through the lining into the muscular wall of the bladder. Invasive bladder cancer may spread to lymph nodes, other organs in the pelvis (causing problems with kidney and bowel function), or other organs in the body, such as the liver and lungs. Brain cancer can have a wide variety of symptoms including seizures, sleepiness, confusion, and behavioral changes. Not all brain tumors are cancerous, and benign tumors can result in similar symptoms. Breast cancer stages range from early, curable breast cancer to metastatic breast cancer, with a variety of breast cancer treatments. Male breast cancer is not uncommon and must be taken seriously. Cervical cancer is mostly caused by the human papillomavirus, or HPV. An HPV vaccine may reduce the risk of cervical cancer. Symptoms of cervical cancer can include painful sex, vaginal bleeding, and discharge. Skin cancers include melanoma, basal cell, and squamous cell. Basal and squamous cell are common and treatment is very effective. Malignant melanoma can be difficult to treat. Colon cancer and cancer of the rectum can begin as a small polyp, detectable through regular cancer screening, such as colonoscopy. Colon cancer symptoms include a change in bowel habits or bleeding, but often there are no symptoms. Lung cancer and smoking often, but not always, go hand in hand. As lung cancer stages advance, lung cancer symptoms include coughing, wheezing, shortness of breath, and bloody mucus. Non-Hodgkin's lymphoma is cancer of the lymph nodes. The cause is unknown; it may be triggered by infection or a compromised immune system. Symptoms may include fever, night sweats, swollen glands, fatigue, and weight loss. Ovarian cancer warning signs include ongoing pain or cramps in the

belly or back, abnormal vaginal bleeding, nausea, and bloating. Depending on the cancer stage, ovarian cancer treatment includes surgery and chemotherapy. Pancreatic cancer is aggressive with few symptoms until the cancer is advanced. Symptoms may include abdominal pain, weight loss, diarrhea, and jaundice. Treatments include surgery, chemotherapy, and radiation. There are often no early prostate cancer symptoms. Prostate cancer treatment includes surgery, chemotherapy, cryotherapy, hormonal therapy, and/or radiation. In some instances, doctors recommend watchful waiting. (WebMD, 2014).

Testicular cancer is cancer that forms in the testis, the egg-shaped glands inside a man's scrotum that manufacture sperm, as well as other male hormones, such as testosterone. Testicular cancer can occur in one or both testes. The two main types of testicular cancer are: Seminomas, which grow slowly and respond better to radiation treatment; Non-seminomas, which grow more quickly. More often than not, both types of testicular cancer form in the germ cells, which are the cells within the testicles that produce immature sperm.

The central nervous system, which consists of the brain and spinal cord, is involved in virtually every function of the body. If a tumor develops in the brain or spinal cord, many vital abilities, including speech, memory, and movement, may be affected. The spinal cord, which runs from the lowest part of the brain, called the brain stem, down the middle of the back, is like a complex messenger service. It carries important messages back and forth between the brain and the rest of the body. For example, if you put your hand on a hot stove, your skin sends a message to the brain via the spinal cord.

Patients with HIV could have other medical problems that put them at risk for serious side effects that result from cancer treatment.

Hereditary and genetic mutation are also reasons of cancer. Some substances cause cancer. Tumor suppressor genes are genes which inhibit cell division and survival. Malignant transformation can occur through the formation of novel oncogenes, the inappropriate over-expression of normal oncogenes, or by the under-expression or disabling of tumor suppressor genes. Genetic changes can happen in different conditions. Mutations are changes in the nucleotide sequence of genomic DNA that can be involved the deletion or gain of a portion of a chromosome, or point mutations, deletions, and insertions. Genomic amplification occurs when a cell gains many copies of a small chromosomal locus, possibly containing one or more oncogenes and adjacent genetic material. Reduced expression of DNA repair genes causes deficient DNA repair. During repair of DNA double strand breaks, or repair

of other DNA damages, incompletely cleared sites of repair can cause epigenetic gene silencing.

Whether cell phone can cause cancer is a sensitive topic in the cancer biology, which is related to the public health, commercial interesting and social development as the phone plays a key function in the modern world. Non-ionizing radio frequency radiation from mobile phones, electric power transmission, and other similar sources have been considered as a possible reason of cancer, but a lot of debates.

Some hormones play a role in the development of cancer by promoting cell proliferation. Insulin-like growth factors and their binding proteins play important role in cancer cell proliferation, differentiation and apoptosis, suggesting possible involvement in carcinogenesis. Hormones are important agents in sex-related cancers such as cancer of the breast, endometrium, prostate, ovary, and testis, and also of thyroid cancer and bone cancer, etc. For example, the daughters of women who have breast cancer have significantly higher levels of estrogen and progesterone.

Most cancers can be diagnosed by signs or symptoms or through screening. However, neither of these diagnosis can be a definitive diagnosis, but it requires the examination of a tissue sample by a pathologist. People with suspected cancer are investigated with medical tests. These commonly include blood tests, X-rays, CT scans and endoscopy, etc.

The tissue diagnosis examined by the pathology indicates the type of cell that is proliferating, its histological grade, genetic abnormalities, and other features of the tumor. Together, this information is useful to evaluate the prognosis of the patient and to choose the best treatment. Cytogenetics and immunohistochemistry are other types of testing that the pathology will perform on the tissue specimen. These tests provide information about the molecular changes (such as mutations, fusion genes and numerical chromosome changes, etc) that give the good references in the cancer treatments.

Cancer is a preventable disease, such as avoiding risk factors including: tobacco, overweight, obesity, an insufficient diet, physical inactivity, alcohol, sexually transmitted infections, and air pollution, etc. However, not all environmental causes are controllable, such as naturally occurring background radiation, and other cases of cancer are caused through hereditary genetic disorders, etc. At least one-third of all cancer cases are preventable.

Aspirin can be used to reduce the risk of death from cancer. Vitamins could be considered in preventing cancer, such as vitamin D can reduce cancer risk.

Vaccines have been developed to prevent

infection by some carcinogenic viruses. Human papillomavirus vaccine (Gardasil and Cervarix) decreases the risk of developing cervical cancer. The hepatitis B vaccine prevents hepatitis B virus infection and decreases the liver cancer.

Cancer diagnosis is involved in physical examination, blood or urine tests, and medical imaging, etc.

The U.S. Preventive Services Task Force recommends cervical cancer screening in women who are sexually active and have a cervix at least until the age of 65. It recommends that Americans should be screened for colorectal cancer via fecal occult blood testing, sigmoidoscopy, or colonoscopy starting at age 50 until age 75. It recommends the screening for skin cancer, oral cancer, lung cancer, or prostate cancer in men under 75. Routine screening is not recommended for bladder cancer, testicular cancer, ovarian cancer, pancreatic cancer, or prostate cancer, etc. It recommends mammography for breast cancer screening every two years for those 50–74 years old.

Surgery is the primary method of treatment of most isolated solid cancers and may play a role in palliation and prolongation of survival. It is typically an important part of making the definitive diagnosis and staging the tumor as biopsies are usually required. In localized cancer surgery typically attempts to remove the entire mass along with, in certain cases, the lymph nodes in the area. For some types of cancer this is all that is needed to eliminate the cancer.

Chemotherapy is the treatment of cancer with one or more cytotoxic anti-neoplastic drugs (chemotherapeutic agents) as part of a standardized regimen. Targeted therapy is a form of chemotherapy which target specific molecular differences between cancer and normal cells. The efficacy of chemotherapy depends on the type of cancer and the stage. In combination with surgery, chemotherapy can be a useful in a number of different cancer types including: breast cancer, colorectal cancer, pancreatic cancer, osteogenic sarcoma, testicular cancer, ovarian cancer, and certain lung cancers. The overall effectiveness ranges from being curative for some cancers, such as some leukemias, to being ineffective, such as in some brain tumors, to being needless in others, like most non-melanoma skin cancers. The effectiveness of chemotherapy is often limited by toxicity to other tissues in the body. Even when it is impossible for chemotherapy to provide a permanent cure, chemotherapy may be useful to reduce symptoms like pain or to reduce the size of an inoperable tumor in the hope that surgery will be possible in the future.

Radiation therapy involves the use of ionizing radiation in an attempt to either cure or improve the symptoms of cancer. It works by damaging the DNA of cancerous tissue leading to cellular death. To spare

normal tissues (such as skin or organs which radiation must pass through to treat the tumor), shaped radiation beams are aimed from several angles of exposure to intersect at the tumor, providing a much larger absorbed dose there than in the surrounding, healthy tissue. As with chemotherapy, different cancers respond differently to radiation therapy. Radiation therapy is used in about half of all cases and the radiation can be from either internal sources in the form of brachytherapy or external sources. Radiation is typically used in addition to surgery and or chemotherapy but for certain types of cancer, such as early head and neck cancer, may be used alone. For painful bone metastasis, it has been found to be effective in about 70% of people.

Palliative care refers to treatment which attempts to make the person feel better and may or may not be combined with an attempt to treat the cancer. Palliative care includes action to reduce the physical, emotional, spiritual, and psycho-social distress experienced by people with cancer. Unlike treatment that is aimed at directly killing cancer cells, the primary goal of palliative care is to improve the person's quality of life. People at all stages of cancer treatment should have some kind of palliative care to provide comfort. In some cases, medical specialty professional organizations recommend that people and physicians respond to cancer only with palliative care and not with cure-directed therapy.

A variety of therapies using immunotherapy, stimulating or helping the immune system to fight cancer, have come into use since 1997, and this continues to be an area of very active research.

Complementary and alternative cancer treatments are a diverse group of health care systems, practices, and products that are not part of conventional medicine. Most complementary and alternative medicines for cancer have not been rigorously studied or tested. Some alternative treatments have been investigated and shown to be ineffective but still continue to be marketed and promoted.

Veterinary oncology, concentrating mainly on cats and dogs, is a growing specialty in wealthy countries, and the major forms of human treatment such as surgery and radiotherapy may be offered. The most common types of cancer differ, but the cancer burden seems at least as high in pets as in humans. Animals, typically rodents, are often used in cancer research, and studies of natural cancers in larger animals may benefit research into human cancer. In non-humans, a few types of transmissible cancer have been described, wherein the cancer spreads between animals by transmission of the tumor cells themselves. This phenomenon is seen in dogs with Sticker's sarcoma, also known as canine transmissible venereal

tumor.

An oncogene is a gene that has the potential to cause cancer. In tumor cells, they are often mutated or expressed at high levels. Most normal cells undergo a programmed form of rapid cell death (apoptosis). Activated oncogenes can cause those cells designated for apoptosis to survive and proliferate instead. Most oncogenes require an additional step, such as mutations in another gene, or environmental factors, such as viral infection, to cause cancer. Since the 1970s, dozens of oncogenes have been identified in human cancer. Many cancer drugs target the proteins encoded by oncogenes.

Cancer stem cells are known to contribute to cancer metastasis and recurrence. Cancer stem cells (CSCs) can be one choice to explain the origin of cancer cells. CSCs resistant to chemotherapy and radiation and thus continuously supply new cancer cells. The CSCs from adult stem cells and progenitor cells are involved in promoting and maintaining oncogenesis. Tumor cells can be epigenetically reverted to tissue specific stem cells when transplanted into a normal stem cell niche (Chen, et al, 2012).

In 2007, Yamanaka's group succeeded doing retroviral transduction of four transcription factors (Oct4), Sox2, Klf4 and C-myc) into mouse embryonic fibroblasts to get iPS cells. Now the iPS cells have been successfully differentiated into various cell types, including hematopoietic and endothelial cells, neural cells, cardiac cells and pancreatic β -cells. Despite these successful reports of in vitro differentiation, iPS cells can induce cancer and not suitable for transplantation into patients currently. iPS cells are very similar in some ways to cancer cells (Knoepfler., 2012). However, iPS can be applied to treat cancer diseases. Embryonic carcinoma or cancer cells are isolated from a type of tumour that sometimes occurs in a foetus to a state of self-renewal. Bone marrow transplants have been done for more than 50 years and are widely used in many hospitals, providing a life saving treatment for cancer and other diseases including leukemia, anemia, and immune disorders. The stem cells at the end of the bone provide the useful opportunities to give these human blood stem cells their superior regenerative abilities. Artificial bone marrow may be used to reproduce hematopoietic stem cells (Ma and Young, 2013).

Prostate cancer occurs when cells in the prostate start to grow uncontrollably. In general, men with prostate cancer have several small tumors in the prostate.

Recently, a new breast cancer vaccine developed at Washington University School of Medicine in St. Louis is reported that can help to treat the breast cancer. The clinical trial results show that

the vaccine is safe in patients with metastatic breast cancer. The study, published in Clinical Cancer Research, shows that this vaccine helps slow the cancer's progression. Researchers developed the vaccine to target the mammaglobin-A, a protein found almost exclusively in breast tissue. The vaccine works to treat a type of white blood cells in the body's adaptive immune system and pinpoint and destroy cells with mammaglobin-A. "Being able to target mammaglobin is exciting because it is expressed broadly in up to 80% of breast cancers, but not at meaningful levels in other tissues," said breast cancer surgeon and senior author William E. Gillanders, MD, Professor of Surgery (Health First, 2014).

Recently, a new method for determining lung cancer risk could more efficiently identify individuals for annual screening and catch more cancers early, according to a study published in this week's *PLoS Medicine*. The study, conducted by Martin Tammemägi of Brock University, Canada, and colleagues, evaluates a lung cancer risk prediction model and identifies a risk threshold for selecting individuals for annual lung cancer screening.

For all the things existed, including the life cells in the earth and universe itself, there is a time to live and a time to die. There are two ways in which cells die: (1) Cells are killed by injury or disease. (2) Cells suicide. Programmed cell death is also called apoptosis, which is cell suicide. Apoptosis is a mechanism by which cells undergo death to control cell proliferation or in response to DNA damage. Some types of cancers, such as B-cell chronic lymphocytic leukemia, follicular lymphoma and tumors infected by human T-cell leukemia/lymphoma virus-1 are characterized by defects in apoptosis leading to immortal clones of cells. Other malignancies have defects in the apoptotic regulatory pathways such as p53 (Ma and Cherng, 2005).

Tobacco smoking causes many types of cancer, including cancers of the lung, oesophagus, larynx (voice box), mouth, throat, kidney, bladder, pancreas, stomach and cervix. There is a link between overweight and obesity to many types of cancer such as oesophagus, colorectum, breast, endometrium and kidney. Diets high in fruits and vegetables may have a protective effect against many cancers. Alcohol use is a risk factor for many cancer types including cancer of the oral cavity, pharynx, larynx, oesophagus, liver, colorectum and breast. Risk of cancer increases with the amount of alcohol consumed. The risk from heavy drinking for several cancer types (e.g. oral cavity, pharynx, larynx and oesophagus) substantially increases if the person is also a heavy smoker. Infectious agents are responsible for almost 22% of cancer deaths in the developing world and 6% in industrialized countries. Exposure to carcinogenic

chemicals in the environment can occur through drinking water or pollution of indoor and ambient air. That occupational carcinogens are causally related to cancer of the lung, bladder, larynx and skin, leukaemia and nasopharyngeal cancer is well documented. Mesothelioma (cancer of the outer lining of the lung or chest cavity) is to a large extent caused by work-related exposure to asbestos. Ionizing radiation is carcinogenic to humans. Ultraviolet radiation, and in particular solar radiation, is carcinogenic to humans, causing all major types of skin cancer, such as basal cell carcinoma, squamous cell carcinoma and melanoma (WHO, 2014).

Metastasis is the spread of a cancer or other disease from one human organ or part to another organ. It was previously thought that only malignant tumor cells and infections have the capacity to metastasize. Metastasis is a Greek word meaning "displacement".

Cancer occurs after a one single cell in a tissue is progressively genetically damaged to produce cells with uncontrolled proliferation. This uncontrolled proliferation, mitosis, produces a [primary](#) heterogeneous tumour. The cells which constitute the tumor eventually undergo metaplasia, followed by dysplasia then anaplasia, resulting in a malignant phenotype. This malignancy allows for invasion into the circulation, followed by invasion to a second site for tumorigenesis.

Some cancer cells need to penetrate the walls of lymphatic and/or blood vessels, after which they are able to circulate through the bloodstream to other sites and tissues in the body.

When tumor cells metastasize, the new tumor is called a *secondary* or *metastatic* tumor, and its cells are similar to those in the original tumor.

Discussion

Cancer, also called malignancy, is an abnormal growth of cells. There are more than 100 types of cancer, including breast cancer, skin cancer, lung cancer, colon cancer, prostate cancer, and lymphoma. Symptoms vary depending on the type. Cancer treatment may include chemotherapy, radiation, and/or surgery (WebMD, 2014).

Fat women are more at risk of cancer than fat men.

Veterinary oncology is a growing specialty in wealthy countries, and the major forms of human treatment such as surgery and radiotherapy may be offered. Animals are often used in cancer research, and studies of natural cancers in larger animals may benefit research into human cancer.

Recently, Harvard University researchers have discovered a specific mutation in human blood, whose carriers are 13 times more likely to develop cancers

like leukemia, lymphoma or myelodysplastic syndrome, etc. A simple blood test could detect that mutation and determine whether the person would get any of those diseases in the next 5 years. These mutations originate in the stem cells of the body. After that they produce mutated cells which reproduce at an accelerated speed until they become a large part of the fraction of the cells in the person's blood. Researchers believe that this data and test could act as a marker, which could help scientists develop preventive vaccines or cure for the disease (Harvard, 2014).

Nearly all cancers are caused by abnormalities in the genetic material of the transformed cells. These abnormalities are caused by the effects of carcinogens, such as tobacco smoke, radiation, chemicals, or infectious agents.

Diagnosis usually requires the histologic examination of a tissue biopsy specimen by a pathologist, although the initial indication of malignancy can be symptoms or radiographic imaging abnormalities. Most cancers can be treated and some cured, depending on the specific type, location, and stage. Once diagnosed, cancer is usually treated with a combination of surgery, chemotherapy and radiotherapy.

Chemotherapy and radiation kills cancer cells, but it also kills healthy cells. Gene therapy is a good choice for the cancer treatment.

References

1. Harvard. Scientists Identify New Cancer Gene. <http://www.voicechronicle.com/201411-scientists-identify-new-cancer-gene>. 2014.
2. Health First. New breast-cancer vaccine shows promise. <http://www.9news.com/story/news/health/2014/12/01/breast-cancer-vaccine/19745295>. 2014.
3. Holland, James F. (2009). *Holland-Frei cancer medicine*. (8th ed.). New York: McGraw-Hill Medical. ISBN 978-1-60795-014-1.
4. Kleinsmith, Lewis J. (2006). *Principles of cancer biology*. Pearson Benjamin Cummings. ISBN 978-0-8053-4003-7.
5. Ling Chen, Tomonari Kasai, Yueguang Li, Yuh Sugii, Guoliang Jin, Masashi Okada, Arun Vaidyanath1, Akifumi Mizutani, Ayano Satoh, Takayuki Kudoh, Mary J. C. Hendrix, David S. Salomon7, Li Fu, Masaharu Seno. A Model of Cancer Stem Cells Derived from Mouse Induced Pluripotent Stem Cells. PlosOne. <http://www.plosone.org/article/doi/10.1371/journal.pone.0033544&representation=PDF>. 2012.
6. Ma H, Cheng S. Nature of Life. Life Science Journal. 2005;2(1):7-15.

7. Ma H, Young M. Induced Pluripotent stem (iPS) cells. *Stem Cell* 2014;5(3):22-25.
8. Manfred Schwab (2008). *Encyclopedia of Cancer (4 Volume Set)*. Berlin: Springer. ISBN 3-540-36847-7.
9. Mukherjee, Siddhartha (16 November 2010). *The Emperor of All Maladies: A Biography of Cancer*. Simon and Schuster. ISBN 978-1-4391-0795-9. Retrieved August 7, 2013.
10. National Center for Biotechnology Information, U.S. National Library of Medicine. <http://www.ncbi.nlm.nih.gov/pubmed>. 2014.
11. Paul Knoepfler. iPS cells are similar to cancer cells: part 1 of discussion of new paper. <http://www.ipsell.com/2012/09/ips-cells-are-similar-to-cancer-cells-part-1-of-discussion-of-new-paper/>. 2012.
12. Pazdur, Richard; et al. (May 2009). *Cancer Management: A Multidisciplinary Approach*. Cmp United Business Media. ISBN 978-1-891483-62-2. (online at cancernetwork.com).
13. Tannock, Ian (2005). *The basic science of oncology*. McGraw-Hill Professional. ISBN 978-0-07-138774-3.
14. WebMD. Cancer. <http://www.webmd.com/cancer>. 2014.
15. Wikipedia. Cancer. <http://en.wikipedia.org/wiki/Cancer>. 2014.
16. Wikipedia. The free encyclopedia. <http://en.wikipedia.org>. 2014.
17. Wikipedia. Renal cell carcinoma. http://en.wikipedia.org/wiki/Renal_cell_carcinoma. 2014.
18. World Health Organization (WHO). Cancer. <http://www.who.int/cancer/prevention/en/>. 2014.

9/15/2014