

Review

Cancer Cause: Biological, Chemical and Physical Carcinogens

Asst. Prof. Dr. Chateen I. Ali Pambuk* and Fatma Mustafa Muhammad

Abstract

College of Dentistry / University of
Tikrit

*Corresponding Author Email:
dr.chatin2@yahoo.com.
Mobile phone No. 009647701808805

Cancer arises from abnormal changes of cells that divide without control and are able to spread to the rest of the body. These changes are the result of the interaction between the individual genetic factors and three categories of external factors: a chemical carcinogens, radiation, hormonal imbalance, genetic mutations and genetic factors. Genetic deviation leads to the initiation of the cancer process, while the carcinogen may be a key component in the development and progression of cancer in the future. Although the factors that make someone belong to a group with a higher risk of cancer, the majority of cancers actually occur in people who do not have known factors. The aim of this descriptive mini-review, generally, is to shed light on the main cause of cancer and vital factors in cellular system and extracellular system that may be involved with different types of tumors.

Keywords: Cancer, Cancer cause, physical Carcinogens, Chemical carcinogens, biological carcinogens

INTRODUCTION

Carcinogen is any substance (radioactive or radiation) that is directly involved in the cause of cancer. This may be due to the ability to damage the genome or to disrupt cellular metabolism or both rendering the cell to be sensitive for cancer development. Many radioactive substances are carcinogens, but their cancer activity varies depending on the type of radiation that may be gamma rays or emitted alpha particles. There are also non-radioactive carcinogens, most commonly inhaled asbestos, some dioxins, and tobacco smoke. Although there are some carcinogens occur as natural substances such as some types of poisonous mushrooms, most of the known carcinogens are manufactured materials (Java, 2008).

There are many natural carcinogens. Aflatoxin, which is produced by a fungus grown in stored grains, nuts and peanut butter, is an example of strong natural substances that cause microbial cancer. Some viruses and also bacteria can actively cause cancer or associate to cause it. The first virus that led to cancer in animals is Ross Sarcoma, which was discovered in 1910 by a Russian

.Furthermore, the chemicals mostly involve as the primary cause of cancer, from which dioxins, such as benzene, kiben, ethylene bipromide and asbestos, are classified as carcinogens (IUPAC Recommendations, 2012).

After the carcinogens enter the body, the body tries to eliminate them through a process called biotransformation. The purpose of these reactions is to make carcinogens more soluble in water so that they can be removed from the body. However, in some cases these reactions can convert a less toxic carcinogen into a more toxic carcinogen. A co-carcinogen is a chemical that does not necessarily cause cancer on its own, but increases the activity of other carcinogens (Yue et al., 2003).

Chemical Carcinogens

The chemical compounds used in the manufacture of food commodities, such as color, flavor enhancer,

preservative, food fortifier, etc., have many health problems, especially if their concentrations exceed the permissible limits, important role in the composition of natural food. Contribute to altering mutations that may alter the composition of cells to be more likely to become cancerous cells. There are many chemical agents that humans use or are exposed to occasionally, other than in foods, may cause cancer as they are able to cause cellular changes at the genetic level. These changes are permanent, causing a permanent mutation called somatic mutation (Vogelstein and Feoron, 1990). These changes may be temporary and end, and both types may affect cell growth or cause death (Yuspa et al. 1994). Tobacco smoke is the cause of cancer, in which the smoking causes 30% of deaths and 87% of lung cancer cases, affecting not only the lungs but also kidneys, pancreas, cervix, stomach cancer, blood, and spinal cord. (Schoket, 2004; Phillips, 2002). Alcohol, as well as many of its agents, is important and prominent causes of cancer, which may cause oral and throat cancer (Aronson, 2003) and that ethyl alcohol is chemically carcinogenic with Chemical formula (C₂H₅OH). The mechanisms of the vital effect, which is produced by these carcinogens, is on the efficiency of detoxifying enzymes which are responsible for the metabolism of carcinogenic chemicals (Isoenzymes) such as cytochrome (P450), which metabolizes chemicals to produce less or more toxic substances from primary compounds (Yang, et al. 1994). On the other hand ethanol and acetate oxidants are catalysts (Yang et al., 1992). Benzene and its derivatives are chemicals that have an effect on cancer as they cause leukemia and lymphoma (Landrigan and Nicholsons, 1989). While Nitrogen, Nitrites and Nitrates are carcinogenic substances, as primary and secondary amines render their genetic cytotoxicity properties and carcinogenicity of their ability to interact with the cellular molecule to form alkalizing agents. Moreover, arsenic is a carcinogen, although it is used in the treatment of acute leukemia, but exposure to arsenic can cause chromosomal changes as it is likely to effect in the end of the chromosome fusions end interventions the telomeres action.

Because of its inhibitory effect in the telomerase enzyme. This causes damage to the end of chromosomes and to induce carcinogenesis or cancer cell death. Here, ironically, the contrasting effectiveness of arsenic is shown to cause cancer or treat it (Chou et al 2001). Many types of drugs that promote the growth of cancerous tumors after development of cancer, such as Amitriptyline, Desipramine, Fluoxetine (Brandes et al., 1992). Furthermore, drugs used for the treatment of stress such as Reserpine cause breast cancer in humans (Weiner, et al 1999).

The chemical compounds do not directly affect the formation of cancer, but their metabolites within the organism can cause cancer. These compounds are transformed into electrophilic reagents that may be able

to calcify or corrode the same living cell depending on where the carcinogenic compound has been subjected to enzymatic interaction. It turns into a carcinogenic compound.

Physical Carcinogens

Radiation

All radionuclides are defined as carcinogens, although the nature of radiation emitted (alpha, beta, gamma, neutron) determines their ability to ionize tissue. Cancer resulting from radiation depends on the type of radiation, the type of exposure and penetration. For example, alpha radiation has a low penetration of surfaces, but can cause cancer when inhaled or ingested. Moreover, X-ray is a human carcinogen known for its retention in various devices and the continuous emission of alpha particles. Ionizing radiation directly affects by its interaction with life systems. Its indirect effects include the release of free ionic roots with solutions and produce damage to the DNA molecule. Oxidation processes lead to cancer (Upton, 1991). Non ionizing radiation with magnetic electron field can be utilized in Neuropsychiatric syndromes (Danilin et al., 1999). Non-Ionizing Radiation causes the removal of granules of multiple forms of white blood cells causing leukemia (Paptheofanis, 1990)

Mineral Fibers

The mineral fiber is a cancer-causing chemical, such as asbestos fibers. The asbestos is found in the primary foodstuff, such as vegetables, meat and oils, it is found in cement used for construction. Asbestos fibers work through certain mechanisms on the development of various types of cancer (Hansen and Mosman, 1997), which stimulates chromosomal abnormalities, genetic mutations, exchange of sister chromatids, neoplastic transformation and deletion of chromosomes (Ault et al., 1995; Hester berg and Barrett, 1995). Furthermore, silica fibers contain materials of Carcinogenic properties that enter the body of the workers in factories by inhalation causing lung cancer (Hoet et al., 2004).

Biological Carcinogens

There are many biological carcinogens that cause cancer, as breast, endometrial and prostate cancers which are caused by steroid hormones that stimulate cell growth and the reproduction in sexual and somatic organs (Sonnonschen and Soto, 2005). Some types of bacteria increase the risk of cancer as in peptic ulcer bacteria *Helicobacter pylori* (Versalovic, 2003), which is an intermediate stage in the development of gastric

cancer (Correa, 1992). In addition, there is a carcinogenic pathogenic bacteria, as in *Helicobacter hepaticus*, which stimulates the development of gastroenteritis (Tomczak et al., 2001). Furthermore, there are also some fungi that may cause the infection. The most prominent of these fungi those living on stored foods, which produced a fungitoxin Aflatoxin B1 (AFB) produced by *Aspergillus flavus* (Abarca et al., 2000), which is, in fact, a risk factor for liver carcinoma and hepatocellular carcinoma (Madden, et al 2002), where it degrades the double helix of DNA, leading to mutations and implantation or deletion of a whole piece of nitrogenic bases during the process of DNA synthesis.

The first virus that led to cancer in animals is Ross Sarcoma, which was discovered in 1910 by a Russian. Currently, there are many viruses that cause cancer and are called tumor viruses (Russell, 1998). These viruses act by abnormal activation of the primary tumor genes, causing cancer or cloning viral cancer genes (Steven and Lowe, 2000). There are many types of these viruses such as T type I virus and type II Human T-cell Lymphotropic Virus type I and II (HTLV-I and HTLV-II). The HTLV-II virus is the cause of L-cell carcinoma of the second type of lymphocytic cell carcinoma aT-cell lymphoma (Hollberg, 1999), while (HTLV-I) is thought to be the cause of Hairy T-cell lymphoma (Cooper, 1997). Moreover, the second type of viruses is hepatitis B and C viruses, which both cause Hepatocellular carcinoma (Tang, 2001). The third type of virus is human papillomavirus (HPV), which is associated with cervical cancer and squamous cell carcinoma (Porthanakasem et al., 2001). The fourth type is Epstein-Barr virus (EBV) is transmitted by malaria parasite and has been observed to be associated with more than 90% of cases of Burkitt's lymphoma and was also associated with stomach cancer and cell-B lymphocytes (Kang et al., 2005). Few parasites are related to cancer and the most important of these parasites is *Schistosoma haematobium* and the relation with bladder cancer (Khurana et al., 2005). Also *Opisthorchis viverrini* Cholangiocarcinoma (Khurana et al., 2005).

Genetic factors

Only about 10% of all cancers occur on a hereditary basis. If cancer is prevalent in the family, it is very likely that these genetic deviations will pass from one generation to the next. Genetic abnormalities may increase the risk of cancer. The genetic factors derived from the inheritance of genes responsible for cancer. It is classified into two types: the first one is Oncogenes. Oncogenes are the primary tumor inherited genes found in the nucleus of the natural cell (Varmus, 1994). These genes activate chromosomal translocation (as in myelocytic chronic leukemia) or gene amplification (as in Pulmonary carcinoma) or when DNA abnormalities, point

mutation or DNA rearrangement and Promotor insertion (Reddy, et al. 1992; Hemminki, 1993). The second gene type is the Tumor suppressor genes, which encodes proteins and inhibits cell transformation and enhance the ceasing of their growth and differentiation and induce programmed cell death (Clark et al., 1993). The most important gene of this type is P⁵³ a 53-kd molecular weight that regulates the expression of many genes and behaves as a control factor during the damage of DNA, any occurrence of such mutations of these genes leads to the development of different types of cancer (Tsugis and Ogawa, 1994).

CONCLUSION

It is common among the public that carcinogens are related to synthetic materials, but in fact they are also found in some natural substances, including some toxins produced by some fungi such as aflatoxin B1, which is produced by the *Aspergillus flavus*, Peanuts are made up of "mold", which leads to cancer in the liver. Some human viruses also cause cancer, including herpes virus, HBV, HCV, HPV, and other viruses. In addition, some types of pathogenic bacteria can cause cancer when they infect humans, including bacteria that live in the stomach, *Helicobacter pylori*, as well as some parasites such as *Schistosomas*. As well as Chemicals and chemical preservatives in food may be an important etiology of cancer

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