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Contact With Harmful Chemicals And Cancer

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ABSTRACT

Problems such as changes in people's lifestyles and standards and environmental pollution have seriously affect human health. It is known that many substances that people eat, drink, use in daily life and are exposed to are harmful to human health. At the beginning of these substances are the substances called “chemicals”. The use of these chemicals has accelerated with the development of industry and technology. It has been determined that many chemicals, which were previously considered harmless, cause diseases, irreversible damages and deterioration of the genetic structure over time.

Cancer is one of the diseases caused by these chemicals. In the cancer statistics of 2020, it has been reported that there are 201 cases of cancer in every 100 thousand people in the world. Despite all the successes in the diagnosis, treatment and prevention of cancer in recent years; unfortunately, the war waged by scientists against cancer has not been fully won yet. In this study, the relationship between cancer and chemicals that are frequently used in daily life without being aware of it are discussed.

Keywords: Cancer, Chemicals, Environment and human health

Zararlı Kimyasallarla Temas ve Kanser

Süreç

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ÖZ

İnsanların yaşam tarzlarının ve standartlarının değişmesi, çevre kirliliği gibi sorunlar insan sağlığını ciddi anlamda etkilemektedir. İnsanların yediği, içtiği, günlük hayatta kullandığı ve maruz kaldığı birçok maddenin insan sağlığına zararlı olduğu bilinmektedir. Bu maddelerin başında ise “kimyasallar” denilen maddeler gelmektedir. Sanayi ve teknolojinin gelişmesiyle bu kimyasalların kullanımı hızlanmıştır. Önceleri zararsız olduğu düşünülen birçok kimyasalın zamanla hastalıklara, geri dönüşü olmayan hasarlara ve genetik yapının bozulmasına neden olduğu belirlenmiştir.

Bu kimyasalların neden olduğu hastalıklardan biri de kanserdir. 2020 yılı kanser istatistiklerinde dünyada her 100 binde 201 kişide kanser vakası olduğu bildirildi. Kanserin teşhis, tedavi ve önlenmesinde son yıllarda elde edilen tüm başarılara rağmen; ne yazık ki bilim adamlarının kansere karşı yürüttüğü savaş henüz tam anlamıyla kazanılmış değildir. Bu çalışmada, günlük hayatta farkında olmadan sıklıkla kullanılan kimyasalların kanser ile ilişkisi ele alınmıştır.

Anahtar sözcükler: Kanser, kimyasallar, çevre ve insan sağlığı

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Introduction

Smoking [1], heavy alcohol consumption [2], exposure to chemicals at work [3,4], sun exposure [5] increase the risk of developing cancer. (Fig 1). Combined with all these risks, the role of exposure to chemicals in causing cancer is debated, and the consequences are not so clear. Scientists continue to do research on how contact with the chemical causes cancer.

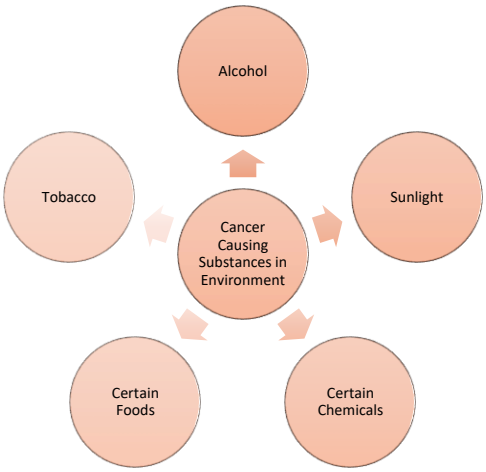

Figure 1. Cancer causing substances in environment

Substances known to cause cancer are defined as carcinogens. It does not mean that cancer will occur as a result of contact with carcinogenic substances. It depends on the exposure and frequency of exposure, in addition to other cancer-causing factors.

Determining which chemicals cause which cancers requires lengthy research. People are unwittingly exposed to trace amounts of many chemicals every day. These daily and discontinuous exposures are generally considered too minor to cause health problems.

Exposure to chemicals outdoors, at home, and at work can increase the chances of getting cancer. Chemicals such as benzene, beryllium, asbestos, vinyl chloride, and arsenic have been found to cause cancer in humans [3,4,6]. A person's risk of developing cancer depends on the duration and frequency of exposure to these carcinogens.

The relationship between cancer and chemicals was discovered by English surgeon Percivall Pott in 1775 [7]. He noted that a large number of chimney sweeps developed scrotal cancer due to their exposure to the soot found in chimneys, which contains chemicals known as polycyclic aromatic hydrocarbons. Since then, many more chemicals have been identified as known or suspected causes of cancer. Much of what is known today about chemicals that cause cancer in humans comes from data from workers exposed to chemicals in their jobs. In this study, literature studies on the relationship between chemicals and cancer in different areas in daily life were examined.

Exposure to Chemicals in Daily Life

Foods and Cancer

In a healthy human body, cells grow and multiply in a controlled manner. However, mutagenic/ carcinogenic factors cause uncontrolled proliferation and mutation of cells. These mutagenic/carcinogenic agents may occur during processing and cooking of foods. Heat treatments, cooking habits, consumption of genetically modified foods, consumption of canned food, foods exposed to pesticides and carcinogenic substances, excessive consumption of fast food cause the accumulation of many substances with toxic effects in the body. These substances affect DNA and cancer-causing DNA replication [8].

Depending on the way you cook food, harmful compounds may form. It is observed that mutagenic/carcinogenic compounds such as heterocyclic amines (HA), polycyclic aromatic hydrocarbons (PAH) and acrylamide are formed as a result of exposure to high temperatures at close range of the building blocks of foods [9].

Heterocyclic amines (HA) are mutagenic/carcinogenic compounds formed by cooking red meat, white meat and fish at high temperatures. Heterocyclic amines are mostly formed during stir-frying, barbecue cooking, and cooking fast food [10]. During cooking, heterocyclic amine precursors rise to the surface of the meat, and when the meat reaches its critical temperature and dehydrates, various reactions occur that lead to the formation of HA. The resulting HAs disrupt the DNA structure and pave the way for cancer formation [11]. Epidemiological studies have reported that frequent consumption of HA-containing cooked meats may increase the risks of colon, prostate, and breast cancers. In addition, DNA attachments of HAs have been detected in human tissues and have been shown to cause extensive damage [12].

Polycyclic aromatic hydrocarbons (PAHs) are polycyclic organic compounds that are commonly encountered and formed by pyrolysis (incomplete combustion) of organic matter resulting from natural forest fires and volcanic eruptions [13]. It is formed by the pyrolysis of carbon-containing substances such as

cellulose, pectin, glucose, fructose, starch, citric acid, malic acid, sucrose, sterols. PAHs are formed when charcoal is cooked on a wood grill. Fats melted in the heated meat fall on the coal and pyrolyze to form PAH. The PAH formed is transported through the smoke and adheres to the surface of the meat. Although there are more than 100 PAHs in nature, 16 of them have been identified as mutagenic/carcinogenic. The highest content of polycyclic aromatic hydrocarbons was determined in meat cooked on charcoal fire.

Acrylamide is formed in foods by cooking carbohydrates at high temperatures and by frying or baking foods such as potatoes and cereals in a high temperature, low humidity environment. The International Cancer Research Center has assigned acrylamides to the "Group 2A (possible carcinogen group for humans)" [14].

Process conditions affecting the frying process affect the formation of acrylamide. It has been observed that acrylamide formation can be reduced without changing the quality properties of the product when microwave frying under vacuum. The reason for this can be shown as the very short duration of the cooking process in the microwave oven [15].

Foods Packing and Cancer

Polystyrene obtained by the polymerization of styrene used in food packaging can pass styrene to food when heated in packages. Styrene is a possible endocrine disruptor and carcinogen. Hepatotoxic and pneumotoxic effects were determined in mice and it was determined that it caused lung cancer [16,17]. Another chemical substance in the structure of polystyrene with known toxic effects is 1,3 butadiene. It has been found to be carcinogenic to humans: it can cause leukemia (CLL, CML) in workers and lymphoma (NHL) in general. The most common use of 1,3 butadiene is in the production of styrenebutadiene rubber for tire and tire products. The highest level of exposure is occupational. It is a very common environmental pollutant. It is generally found in the ambient air as exhaust gas and cigarette smoke [18].

Melamine is a Group 3 carcinogen according to the International Agency for Research on Cancer (IARC). There is ample evidence that it is carcinogenic in animal studies, it has been shown to cause bladder cancer, but in humans the evidence is inconclusive [19]. Melamine is also nephrotoxic. It has led to an epidemic of kidney stones and acute kidney injury in children in China. According to the WHO report, 51,900 children were affected by this epidemic and 6 deaths occurred [20,21].
Formaldehyde is a Group 1 carcinogen according to IARC: there is evidence that it causes nasopharyngeal cancers in workers, as well as leukemia, particularly myeloid [22].

It has been stated that vinyl chloride used in PVC production is a known carcinogen for humans. Vinyl chloride is carcinogenic to humans. It has been shown to cause liver angiosarcoma in workers and is associated with an increased risk of cirrhosis and hepatocellular cancer. There are suspicions that it causes connective tissue and soft tissue malignant tumors [23]. Vinyl chloride is most commonly used in PVC production. PVC is known as toxic plastic. It is the least recyclable type of plastic.

Bisphenol A was first synthesized in 1891 and used as an artificial estrogen compound in the 1930s. BPA began to be used in the plastics industry in the 1940s-50s. It is used in some dental materials, as an inner coating in food and beverage containers, in feeding bottles, toys, and even in cosmetics and foods [24]. In studies on the health effects of BPA, it has been determined that BPA stimulates prostate and breast cancer cells [25].

Cosmetics and Cancer

Cosmetic products may be absorbed through the skin and cause systemic toxicity. Hundreds of chemical products are used in many cosmetic products such as make-up products and shampoos. All these chemicals are thought to cause many problems such as cancer, infertility or birth defects.

Metals in cosmetic products cause cancer, respiratory diseases and organ dysfunctions due to metal toxicity [26]. It has been determined that carbon black, which is used as a colorant in make-up materials such as eyeliner, eyeshadow, and mascara, is carcinogenic as a result of experiments with rats and mice [27] .

Cadmium is used in the manufacture of lipstick, body and hair creams. Cadmium has a carcinogenic effect by being stored in the kidney and liver [28]. The accumulation of cadmium in the human body can damage important organs such as the lungs, liver, kidneys and central nervous system. Studies have shown that the accumulation of cadmium in the body increases the risk of breast, prostate and endometrial cancers [29].

Conclusion

We are often unconsciously exposed to chemicals in many products we use in our daily lives. Many diseases such as allergies, autoimmune diseases and cancer are now associated with these chemicals. In order to be protected from negative consequences as much as possible, attention should be paid to the method of cooking and storing foods. Care should be taken to choose the ones with clean ingredients in cosmetic products that are different in every age group, from older to younger. Occupational safety precautions should be followed carefully in order to be protected from chemicals that are exposed due to work. Care should be taken to use products with clean ingredients in cosmetics.

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