Food Contaminants and Food Safety

Rabia SARIKAYA¹ & Şükran ÇAKIR ARICA²

Keywords
Food contamination, food safety, public health.

Abstract
Food safety, production of food to ensure a healthy and reliable food production, transportation, storage, distribution and consumption of the necessary rules during the stages of compliance and taking measures are called. Food Safety is a very important issue for the environment and public health. Air, soil and water pollutants exposed to agricultural products in agricultural areas threaten food safety considerably. Apart from air, soil and water pollutants, our food is exposed to many food pollution from production to consumption. Food additives, pesticides, hormones, use of fertilizers, genetically modified organisms, wastes, sewage and septic leaks as a result of lack of infrastructure, microbiological pollution, radiation residues, food contaminating contaminants during the packaging and storage, mycotoxins etc. affect food safety and hence human health negatively. The aim of this study is to provide information about the main sources of contamination in foods and the precautions that can be taken for safe food production.

1. Introduction
Healthy nutrition is also a measure of quality life. In order to be able to eat healthily, food safety must be provided from the field to the table. Starting from the farmer, it is very important for the public health to inform all consumers and suppliers in the food chain about the reliable food consumption as well as the end consumer.

The most important thing to know in terms of food safety is the amount of toxic for each chemical. This information is the basis for toxicology bu Everything is poison. It is the dose that separates the drug and the drug ". Each chemical may have toxic effects depending on the amount taken, which is also called a dose-response relationship. For example, the sodium ion concentration in the blood of a person who consumes 500 grams of the table salt (sodium chloride) used in meals increases and death can occur. Spinach and tomato, which are rich in oxalate, are consumed in kilos at one time and thus produce toxic effects. Oxalate causes calcium deficiency in the organism when taken in high doses, leading to muscle cramps, cardiovascular toxicity and kidney failure (Beier, 1990). As a result,

¹ Gazi University, Faculty of Education, Department of Basic Education
² Corresponding Author. ORCID: 0000-0003-1413-1143. ISTE Faculty of Marine Sciences and Technology, Water Resources Management and Organization, sukran.cakir@iste.edu.tr
although tomato and spinach are healthy foods, they are toxic depending on the amount (dose) when they are over-consumed in the daily diet. In short, the dose separating the drug with poison.

Another important issue in food safety is food contamination. Any contamination of undesired harmful substances (contaminants, wastes, microorganisms, etc.) through the supply chain (from farm to fork) to a foodstuff for consumption is called food contamination. Foods may be contaminated by chemical, physical and biological agents. Contamination can occur directly or through cross-contamination. Cross-contamination is the indirect transmission of harmful substances to food. For example, when a person touches a raw food, such as chicken meat contaminated with microorganisms, with his bare hands, then he touches a food that will not be cooked like a salad or will not be heat treated.

The World Health Organization (WHO) has adopted food contamination as a global issue in various documents and reports. Consumption of contaminated foods causes disease and even death in millions of people worldwide (Fukuda, 2015).

The main sources of contamination in foods include food additives, pesticides, hormones, fertilizers, genetically modified organisms, wastes, sewage and septic seepage due to lack of infrastructure, microbiological contamination, radiation residues, food contaminants contaminated during food packaging and storage, mycotoxins etc. It comes. All these chemicals used in the production of food are toxic in a dose-dependent manner as mentioned above. Food contaminants that may be present in foods are listed below.

- Food Additives
- Hormones
- Fertilizers used in agricultural fields
- Microbiological contamination
- Pesticide residues (organic chlorinated pesticides, DDT etc.)
- Heavy metals (Lead, Cadmium, Mercury, Arsenic)
- Halogen compounds
- Pollutants transported from packaging materials to food
- Mycotoxins (Aflatoxin, Ochratoxin)
- Pollutants during cooking (acrylamide etc.)
- Chemicals formed as a result of chemical reactions in foods (N-nitroso compounds)
- Genetically Modified Organisms

In this study, we will focus on the above mentioned food contaminants and their effects on human health.
2. Food Additives

In modern life, the use of chemical substances, which enable food to be consumed longer than production and consumption, has become obligatory. According to the Turkish Food Codex Regulation on Food Additives, with or without nutritional value, as a result of the addition to the food in the stages of production, treatment, processing, preparation, packaging, transportation or storage, which are not consumed as food alone and are not used as the characteristic component of the food. Itself or by-products are substances that are expected to be directly or indirectly a component of that food (URL 1).

The International Food Codex Commission (Codex Alimentarius Comission-CAC) was established with the cooperation of WHO and the Food and Agriculture Organization (FAO). The Food Additive Committee (JECFA-Joint Expert Committee on Food Additives), a subsidiary of the Food Codex Commission, prepares standards for all countries in their meetings on food additives every year. JECFA determines and approves the maximum amounts of additives to be added to food by carrying out toxicological studies on experimental animals. If necessary, studies to investigate the allergic effect of food additives on human. When the analyzes are completed, it determines the daily consumable amounts of food additives (Acceptable Daily Intake - ADI) and the no-adverse effect level (NOAEL) (ILSI Europe Report Series, 1997; Commission and the European Communities 2001).

On the packages of prepared foods are E numbers (URL 2), a practical coding method developed in the European Union countries. The classification of food additives according to basic functions with E number system is as follows:

- Colorants E100-180
- Protectors E200-297
- Antioxidants E300-321
- Emulsifiers and stabilizers E322-500
- Acid-base providers E500-578
- Sweeteners, fragrances E620-637
- Wide purpose food additives E900-927

There are many studies on the effects of food additives on human health. For example, sodium nitrites. sodium nitrite produces nitrosamines. Nitrosamines are linked to an increased risk of pancreatic and colorectal cancer. Sulphites are a preservative many people are sensitive to that can severely aggravate asthma. The FDA has banned trans fats in food because they increase the risk of heart disease. Manufacturers use these partially hydrogenated oils to improve the shelf life and consistency of cookies, crackers and other packaged foods. People sensitive to Monosodium glutamate (MSG) can experience nausea, breathing problems and other reactions. MSG adds extra sodium that can also elevate blood pressure. Some artificial coloring agents, used in candy and cereal, can cause severe allergic reactions in those with asthma. Some research also suggests a link with hyperactivity in children, but this has not been proven.
Despite a significant effort to assure safety of use, toxicological analysis of food additives, generally, rely on their direct toxicity to target organs (liver and kidney) or their genotoxic effects. Much less attention is paid to the effects of these compounds on cells of the immune system. Although much attention has been drawn in the past decades to obesity and metabolic syndrome as a result of ingesting highly processed food containing large amounts of fat and simple sugars, mounting evidence suggest that food additives may also be important contributors to metabolic derangement. There are lots of studies showing that food additives have relevant effects on cells of the immune system that could contribute to immune-mediated metabolic dysregulation (Neto et al. 2017).

The incidence of autoimmune diseases (AD) is increasing worldwide, especially in western countries. The increasing use of industrial food additives explains the increase observed in autoimmune disease. Multiple sclerosis, type 1 diabetes, inflammatory bowel diseases (mainly Crohn's disease), systemic lupus erythematosus, primary biliary cirrhosis, myasthenia gravis, autoimmune thyroiditis, hepatitis and rheumatic diseases, bullous pemphigoid, and celiac disease are several AD examples. When the annual increase in AD cases is examined by using industrial food additives, it is seen that the highest increase is neurological and followed by gastrointestinal, endocrine, rheumatic diseases (Lerner and Matthias 2015).

It is impossible to completely isolate ourselves from the consumption of food additives. Therefore, as a consumer, one-way nutrition should be avoided, adequate and balanced nutrition should be provided to minimize the potential risks of food additives and quick ready meals should be avoided if possible in daily diet. Another point to be aware of is to make children, pregnant and lactating women and young people become aware of food additives harms (Erden Çalışır and Çalışkan, 2003).

Children are suffering the most from food additives because they are exposed to food chemicals from infancy, and human bodies were not meant to be exposed to the degree of chemicals and food additives that we are currently. These additives, may include side effects, food allergies, increased waist lines, decreased absorption of minerals and vitamins, cancer and more (Boğa and Binokay, 2010)

3. Hormones

Natural and synthetic hormones are widely used to increase the growth in animal husbandry. Among these are natural steroids such as estradiol, progesterone and testosterone, as well as synthetic derivatives of zeranol, melengestrol acetate and trenbolone acetate. The use of hormones in food-derived animals is prohibited by the European Union in accordance with Directive 96/22 / EC on the possibility of toxic effects on public health. Although many are foreseen to be banned and used only in specific cases under strict control measures, veterinary medicines are also used to improve the ability to treat or benefit from livestock in farm animals (Çetinkaya and Muş 2010).

There are several studies that reveal the presence of residues related to hormones and similar substances in animal-derived foods. Veterinary medicines contained in animal foods and their residues can pose a danger to human health. As a result of
the research conducted by the European Commission on "Determination of the Potential Risks of Hormone Residues in Beef and Products on Human Health"; The studies conducted on progesterone, testosterone, zeranol, trenbolon acetate and melengestrol acetate, which cause an absolute carcinogenic effect, especially tumor formation and progression, are not sufficient to confirm the risk of carcinogenicity; and the greatest risk group with carcinogenic effect potential has been reported as pre-adolescents (Reig and Toldra 2008; Anonymous 1999).

4. Fertilizer residues in agricultural areas

The use of nitrogen fertilizers in agricultural areas increases the amounts of nitrate and nitrite salts taken with food. Organic fertilizers used in organic farming cause microbial pollution. The use of untreated sewage water and direct organic animal manure in irrigating agricultural land can also cause pathogenic bacteria and parasitic contamination in plant products.

5. Microorganisms

Apart from some sterile products, microorganisms can be found in the foods we consume. These microorganisms can be found naturally in food as well as in the production process, during packaging, storage or transportation. Common bacterial hazards are Bacillus cereus, Campylobacter jejuni, Clostridium botulinum, C. perfringens, Pathogenic Escherichia coli, Listeria monocytogenes, Salmonella spp., Shigella spp. Microorganisms in foods cause food spoilage and cause infection or toxic effects in humans.

Fecal coliform bacteria are naturally found in the intestines of warm-blooded organisms. If the presence of fecal coliforms in food is more than a certain number, it is accepted that the risk of pathogenic bacteria such as Salmonella is increased. Food poisoning occurs due to the food that is grown in food and the food produced by these products. The vast majority of world food sources suffer from microorganisms. Many of the bacteria that are dangerous for the public health are usually reproduced without changing the taste and smell of the food (Ayhan, 2000).

Microorganisms in foods are grouped as follows in terms of the severity and frequency of their effects (URL 3).

Severe hazards: Clostridium botulinum, Shigella dysenteriae, Salmonella typhi, paratyphi A, B; Hepatitis A ve E; Brucella abortus, B. suis; Vibrio cholerae ; Taenia solium; Trichinella spiralis

Moderately effective but common hazards: L. monocytogenes; Enterovirulent Escherichia coli (EEC); Streptococcus pyogenes; Rotavirus; Norwalk virus grubu; Diphillobothrium latum; Ascaris limricoides, Cryptosporidium parvum

Moderately effective but limited prevalent hazards: Bacillus cereus; Campylobacter jejuni; Cl. perfringens; Staph. aureus, Vibrio parahaemolyticus; Y. enterocolitica; Giardia lamblia.

Foods can often be transmitted by people with a fecal oral route or by contaminated water. Viruses are pathogenic and cause various diseases in living beings. Hepatitis A is one of the most important viral agents found in foods that are
resistant to heat treatment. It is usually found in stool. Foods prepared in poor hygienic conditions and cooked, cold foods, sandwiches are among the most important causes of contamination. It spreads due to the defeat of the vegetables, which are irrigated with the sewage water where the human wastes are mixed. Viruses only die due to high cooking temperatures. With chlorination and UV application, viruses on the surfaces in contact with water and food can be inactivated. Prions are compounds of the protein structure, also known as is mad cow da disease. They can infect people with contaminated beef.

May cause toxic effects on algae in foods. For example, some species from the genus Cyanobacteria (blue-green algae) and Pyrrophyta (dinoflagellates) produce toxic compounds for some other living things, and these compounds pass on to humans with aquatic products. For example, the paralyzing id Paralytic Shellfish Poison Po (PSP), the diarrheal DSP (Diarrhetic Shellfish Poison), the loss of memory causing the ASP (Amnesic Shellfish Poison) nerve system affecting the NSP (Neurotoxic Shellfish Poison) are the most important (URL 3).

6. Pesticides

Pesticides that form residues in plant products can cause acute or chronic intoxications through food chain in human and other living things. Unconscious use of pesticides and the lack of attention to the harvesting range are the main problems in food pollution. It is very difficult to detect pesticide residues in plant and animal products. Knowing the amount of pesticide residue in foodstuffs is important in human health as well as in exported food products. Pesticide residues in animal products in our country in many of the dairy products in the pesticide residues were found to be much above the tolerance limits (Acar and Uysal 1998). In addition, it was determined that pesticide residues were not completely eliminated in the bread obtained from the wheat used in the pesticides used against the warehouse pests in our country. Residues of organic phosphate-based and chlorine-containing insecticides are found on foodstuffs.

They are toxic and affect the nervous system and some are carcinogenic. Organachlorine chlorinated pesticides at the beginning of pesticides threaten the food security commonly used in Turkey (chlorinated hydrocarbons) remain long-term degradation of the environment (URL 4).

The most important compound of this group is Dichlorodiphenyl trichloroethane (DDT). DDT, first synthesized in 1874, was widely used for many years. It was used as an insecticide during World War II to protect soldiers and civilians from malaria, typhus, and other vector-borne diseases (WHO Persistent Organic Pollutants: Impact on Child Health report, 2010).

DDT was aggressively used to kill the beetles that spread Dutch Elm disease; this resulted in the bioaccumulation of DDE in earthworms. The levels were high enough that robins and other songbirds ingesting the earthworms received lethal doses, resulting in large losses of birds (Fry, 1995). Even after DDT was banned in 1972 in the USA, DDT-thinned eggshells continued to put many bird species – including bald eagles – at risk of extinction (Raloff, 1994) as eggshells cracked under the weight of mother birds.
Although it is effective against malaria, it is forbidden in many countries after the
determination of high amounts of residues in human milk as a result of
consumption of meat and dairy products containing DDT, which cause significant
damage to food safety and health, and consumes significant residues in food and
environment. DDT has been found to cause leukemia, Hodgkins disease, anemia,
cirrhosis and liver cancer.

Although the consumption of pesticides is low according to the records by Delen,
(2003), trifluranlin, mancozeb, patathion-methyl, and dichlorovos (DDVD) cause
carcinogen risk. 2,4-D poses a danger to other carcinogenic chemicals. Even the
most pure and clean food, known as mother's milk, carries over 100 chemical
impurities, mainly chlorinated compounds such as DDT, polychlorobiphenyls,
dioxins (URL 5). Around 600 chemicals were found in drinking water (Neely,
1994).

Polychlorinated biphenyls (PCBs) are industrial insulation and lubricants which
can cause cancer and nervous system diseases and can be transmitted to foods in
various ways. They don't break down easily. With the prohibition of the use of
PCBs, the amount of PCBs in animal foods has decreased in recent years. PCBs have
teratogenic and neurotoxic effects. The most important effects in humans;
stubborn acne in the head and chest skin. PCB compounds cause cancer
progression rather than initiating. PCB compounds were reported to cause tumor
increase in liver, skin and lungs (Gad, 2005).

The characteristics of DDT and PCBs result in concern for human and other
species' health and the global environment because these chemicals;

have long half-lives and so persist in the environment for years or decades;

bioaccumulate and biomagnify, penetrating the food chain – that is, they
concentrate at higher levels as they make their way up the food chain, thus
polluting and exposing all living things, including humans;

are dispersed globally, travelling in air and water currents and in living organisms;

are linked with serious health effects in humans and other living organisms (UNEP,
2005).

7. Dioxins and furan compounds

Industrial bleaching by-products used in the production of PVC, can cause damage
to the endocrine system in the human body and cancer. Dioxin has been classified
as a known human carcinogen (National Toxicology Programme, NTP, 2005).
Within the listing of substances classified as “reasonably anticipated to be a human
carcinogen” are DDT, hexachlorobenzene, furan, mirex, PBBs and PCBs. The
International Agency for Research on Cancer (IARC) classified these substances.

Dioxins can be used to burn domestic solid wastes, coal, wood and petroleum
products, synthetic oil-coated materials, transformer oils and chlorinated bleached
products; During the processing and melting of the ore in the iron and steel
industry, and as a result of fires, dioxins are formed. Dioxins are the most toxic
chlorinated organic compounds transmitted to food. The dioxins that are involved
in air, soil and water accumulate in the body of animals by feeding to animals and
are transported to humans by animal foods. Dioxins are always a potential hazard to the environment and people because of the fact that their chemical structures are constant and their natural structures are lipophilic (Young, 2005). In high temperature environment, chlorinated compounds are converted to high temperature resistant chemical substances with the effect of oxygen in the air. It is thought that the trace amount of chlorine found naturally in the wood is sufficient for the formation of dioxin. The dioxins formed by combustion can be mixed with air and soil, dioxins can be transmitted to animals that breathe air and eat grass that occurs in soils. Dioxin, breast, prostate and immune system cancers, hormonal imbalance, heart related problems and obesity are recognized as the causes of diseases.

The products in the plastic group, which may contain dioxins and other plastic builders, are exposed to chemical effects as a result of daily use: Water pipes, plastic bottles, synthetic rubber and plastic products, artificial leather, water and oil based paints, cardboard coverings, waterproof coatings, machine-made rug, adhesives and gums, detergents, cleaning agents made of petroleum, industrial cleaning agents, household pesticides, insect repellent drugs, perfume, shampoo, hair products, nail polishes, etc. Foodstuffs covered with plastic cover (URL6).

8. Heavy Metals

Heavy metals have been used by humans for thousands of years. Although several adverse health effects of heavy metals have been known for a long time, exposure to heavy metals continues, and is even increasing in some parts of the world, in particular in less developed countries, though emissions have declined in most developed countries over the last 100 years. Heavy metals are toxic substances which are naturally found in nature and can be transmitted to the environment as a result of mostly urban and industrial processes. Heavy metals can infect foods from the environment to grains, from animals to milk and meat, from contaminated waters to fish, or from food and equipment to food. Heavy metals are mercury, copper, iron, cadmium, nickel, lead, arsenic, zinc, which can cause toxic effects or sudden death on humans, from food, water, environment and air. The effect of heavy metals on children is more sensitive than adults (Omaye, 2004).

The main threats to human health from heavy metals are associated with exposure to lead, cadmium, mercury and arsenic. These metals have been extensively studied and their effects on human health regularly reviewed by international bodies such as the WHO.

Cadmium compounds are currently used in rechargeable nickel-cadmium batteries. Cadmium emissions have dramatically increased in the 20th century.

Smoking is an important source of cadmium exposure. In non-smokers, food is the most important source of cadmium exposure. Recent data suggest that adverse health effects of cadmium exposure may occur at lower exposure levels than previously predicted, possibly kidney damage, possibly bone effects and fractures.
Exposure to arsenic is mainly via intake of food and drinking water, food being the most important source in most populations. Long-term exposure to arsenic in drinking-water is mainly related to increased risks of skin cancer, but also some other cancers, as well as other skin lesions such as hyperkeratosis and pigmentation changes. Occupational exposure to arsenic, primarily by inhalation, is causally associated with lung cancer. Clear exposure–response relationships and high risks have been observed.

The general population is primarily exposed to mercury through food, fish is the main source of methyl mercury exposure and is the dental amalgam. Although the general population, some groups with high fish consumption, have low blood levels in adults with a low risk of neurological damage, they do not face a significant health risk from methyl mercury. Pregnant women should avoid taking large amounts of certain fish, such as sharks, swordfish and tuna, especially as they pose a risk to the fetus (Järup L. 2003).

Mercury in paints, mercury in canisters, arsenic in contaminated water, cadmium in painted cookware may cause memory loss, delay in development, delay in movement and cancer.

9. Halogen compounds
Fluorine, chlorine, iodine and bromine are complex compounds that are derived from them. Gasoline, toothpaste, paint, disinfectants and cleaning products, pesticides, water disinfectants (chlorine) and drugs used in the treatment of drugs (chlorine in some of the drugs) are halogen-containing products. Halogens can cause health problems such as anemia, hormonal damage, brain damage, energy loss, hyperactivity, obesity or attenuation, cardiac arrhythmias, immune system weakness, and cancer (Erkmen, 2010).

10. Pollutants transported from packaging materials to food
Various packaging materials cause contamination of foodstuffs depending on the production techniques and the substances they contain. Therefore, when selecting a packaging material, it should be ensured that it is more reliable than health. The formula of the packaging material used and the toxicity of the ingredients should be known. At the time of its first use, plastics were known as non-reacting substances and little was known about the materials used in their production and their chemistry. In the following years, color changes in food, flavor and odor loss and some of the biological effects of plastic used in packaging is revealed. For example, vinyl chloride-related health problems have shown that some monomer residues can be contaminated with foodstuffs due to plastic packaging. A variety of plastics, such as acrylonitrile, vinylidene chloride, butadiene and styrene polymers, also create problems. Problems arise in cartons prepared with paraffin wax. Until recently, paraffin wax was thought to be a hard substance. However, in the case of paraffin-coated cartons contaminated with 3-4 benzopyrene, a food such as milk can extract this substance, which is carcinogenic. Due to contamination caused by food interactions from packaging material, various countries have issued standards for and specifically implemented plastics for packaging and packaging (URL 7).
9. Mycotoxins: Mycotoxins can be formed directly from food and feed by mold growth and development, but can also be found indirectly in meat, milk and eggs of feed animals fed with mycotoxin. The main mycotoxins which have been emphasized today are aflatoxins (B1, B2, G1, G2), Ochratoxin A, trichothecenes and zearalenone. Among the mycotoxins, the most known ones are aflatoxins. It was found that approximately 35% of the Aspergillus flavus cultures and a significant portion of the A. parasiticus cultures formed aflatoxin. After aflatoxin B1 is taken into the body, it is transferred to the mother’s milk and urine. Aflatoxin increases the incidence of hepatitis B and liver cancer. It has been determined that aflatoxin B1 is mutagenic, but it is not clear whether it is carcinogenic. On the other hand, ochratoxin is one of the most frequently studied mycotoxins in food. A significant part of the presence of Ochratoxin A in the diet results from cereals and cereal products. Ochratoxin A is known to cause kidney damage in humans. In some toxicological studies, Ochratoxin A was also found to be carcinogenic (URL 3).

11. Pollutants during cooking (acrylamide etc.)

Acrylamides and polymers are widely used in the treatment of drinking and waste water, in the recovery of petroleum products, in the cleaning materials industry, in the cosmetics industry, in the production of food packaging, in the production of plastics. Some amino acids (eg asparagine) in the composition of fried foods and sugars from the sugars may result in acrylamide. Grain products such as biscuits and crackers, potato chips and fries are the highest content of acrylamide (Giray and Soysal, 2007). Acrylamide has been shown to have toxic effects on the nervous system of humans and animals and on the reproductive organs of male experimental animals. As a result of the studies, acrylamide and its polymers have been evaluated as mutagenic because they cause genotoxic effect for somatic and sex cells, and genetic damage to genes and chromosomes (Ayaz and Yurttagul, 2008).

12. Chemical pollutants as a result of chemical reactions in foods (N-nitroso compounds)

These additives can be used in meat products such as sausage, salami, sausage, ready meat dishes, smoked fish, salted steaks for the purpose of preserving the antimicrobial properties of foods and the natural color of the foods. It is known that nitrates and nitrites can turn into carcinogenic compounds such as nitrosamine, which play a role in the formation of cancers of the liver, lung, kidney, larynx, stomach and pancreas. It is stated that infants and young children should not be allowed to eat such foods. Nitrites combine with hemoglobin in blood to form methemoglobin and prevent oxygen carrying capacity of hemoglobin. Children and pregnant women should be kept away from food containing nitrate and nitrite (Erkmen 2010).
13. Genetically Modified Organisms (GMO)

Biotechnological methods, a species other than its own type of gene by transferring certain plant-animal or microorganisms that have been changed, transgenic or genetically modified organism (GMO) is called. By gene technology, a foreign gene is introduced into the DNA from another plant, even from an animal or microorganism. In this way GMOs occur and the technology used in their production is called recombinant DNA technology. As transgenic products carry genes that do not belong to their species, unlike other products grown in nature, environmental and human animal health can pose a risk to biodiversity. Genes transferred to plant products through existing biotechnological methods originate from plants, bacteria and viruses. Antibiotic resistance genes (kanamycin and ampicillin) are used as markers during gene transfer. Along with gene transfer, it is also an important risk to carry the characteristics of the disease and allergy. New characteristics transferred to living things can lead to the deterioration of plant sociology and the loss of genetic diversity in natural species during genotyping. In addition, resistance to antibiotic resistance genes to human or animal structure, the transfer of genes transferred to human beings in the possibility of convergence, the origin of virus-derived genes to transfer the resistance gene to other viruses and other risks to human and animal health are other disadvantages. Use of food with GMOs Allergies in the human body may manifest as mouth and lip swelling and itching in the mouth, flushing and swelling of the eyes, difficulty in breathing in the respiratory tract, abdominal pain in the digestive tract, diarrhea, vomiting and skin rashes (Smith 2007).

On International Agency for Research on Cancer (IARC) AR, a subsidiary of the World Health Organization, established in 1965, is being prepared by the International Agency for Research on Cancer. The IARC classification and the number of chemicals and activities involved in this classification are shown in Table 1 (URL 2).

<table>
<thead>
<tr>
<th>Class</th>
<th>Definition</th>
<th>Number of Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Human Carcinogens</td>
<td>107</td>
</tr>
<tr>
<td>Group 2A</td>
<td>Probably Cancer In Human</td>
<td>58</td>
</tr>
<tr>
<td>Group 2B</td>
<td>Possible to Generate Cancer in Human</td>
<td>249</td>
</tr>
<tr>
<td>Group 3</td>
<td>Carcinogenic Effects Are Not</td>
<td>512</td>
</tr>
<tr>
<td></td>
<td>Classified as Human Cancer Makers</td>
<td></td>
</tr>
<tr>
<td>Group 4</td>
<td>Probably Not Cancerous in human</td>
<td>1</td>
</tr>
</tbody>
</table>

If we give examples of the factors in the groups, we can see which group of some of the chemicals mentioned above are included.

Group 1 pollutants: Aflatoxins (B1, B2, G1, G2), Arsenic and inorganic arsenic compounds, Benzene, Tobacco use, and passive smoking, Alcoholic beverages, Benzo (a) pyrene (the most important member of polycyclic aromatic hydrocarbons), Asbestos, Hepatitis B and C infection, Chinese salted fish (Other salted fish preparation groups, Radionuclides, UV radiation Pollutants in Group 2A: Acrylamide, Nitrate and Nitrite (due to intrinsic
Pollutants in Group 2B: Acetaldehyde, Aflatoxin M1, DDT, Fusarium moniliforme (due to fumonisins B1, B2 and fusican C toxins), Butylated hydroxy anisole (BHA), Furan, Ponceau 3R, Ponceau MX, Safrol, Titanium dioxide. Pollutants in Group 3: Acrolein, Amarant, Orange I, Sodium Cyclamate, Saccharin and salts, Yellow AB, Yellow OB, Chlorinated drinking water, Caffeine, Phenol, Ponceau SX, Paracetamol, Sulfur dioxide, Metabisulfite, Sudan I, II, III, Patulin.

We can say which chemicals trigger the cancers (URL1). Prostate cancer: Although it is not fully seen in most men, it is stated that 40% of men over the age of 50 and 70% of men over 80 years of age have prostate cancer and this phenomenon may turn into harmful cancer if triggered by chemical toxic substances. Trigger of prostate cancer include environmental pollutants, cadmium mainly toxic metals, cigarette smoke, pesticides from each group, exhaust gases.

Breast cancer: Breast cancer is the leading cause of cancer deaths and is linked to chemical toxic substances that cause genetic inheritance and environmental contamination. One of these toxic substances is xenoestrogen, which is one of the substances that mimic estrogen or which leads to changes in estrogen activity and is found in birth control pills. Other chemicals that may cause breast cancer include: Detergents, organo-chlorine-containing pesticides (DDT, PCB, dieldrin, lindan), plastics (BPA, PET bottles, etc.), chlorine-containing chemicals, solvents, synthetic estrogens used for hormones, birth control pills, toxic metals (cadmium, barium, chromium, lithium, lead acetate, tributyltin, antimony), organophosphate and synthetic based (pyrethroid) pesticides.

Immune system cancers: Recently, we can list the chemicals that are known to trigger immune system-related cancers such as blood cancer, Hodgkins lymph cancer, bone marrow cancer and non-Hodgkins lymph cancer from the dense types of cancer: Vinyl chloride based plastics (PVC), toys and phthalates in child care items, insecticides (carbamates, organo-chlorines, organophosphates, herbicides (phenoxy-acid based), foreign herb medicines (2-4 dichlorophenoxyacetic acid groups; dicamba, carbon-tetrachlorid and atrazine group), fungus drugs (captain group), air pollution caused by heavy traffic, hair dyes, cosmetics, nuclear energy, medical drugs (rheumatoid arthritis, drugs such as HIV etc.), PCB and dioxins, environmental pollutants, solvents.

Foods are exposed to the contamination of dozens of non-food chemicals due to industrialization and increased environmental pollution. In parallel with the increase in population, the use of additives in food production increases due to the need for more food. Food safety management systems have been established in order to ensure healthy and reliable food production, competition and sustainability. It is based on the principles of the TSE 13001 standard established by the Turkish Standards Institute (TSE). These standards ensure quality and safe food production from farm to fork at international standards. All responsibilities in the area of food safety in Turkey has been given to the Ministry of Agriculture and Rural Affairs (Erkmen, 2010).

The excessive use of chemical fertilizers in many developed countries, including in Turkey, the use of food additives and many other factors such as pesticide and environmental pollution affect food quality. This increases the risk for the
environment and human health. In order to minimize the health risks posed by food contaminants, it is very important to regulate practices and narratives such as seminars, panels and symposiums on food safety issues, to transfer existing risks to large segments of society and to inform them. There is also a managerial commitment to food safety; increasing legal regulations and audits; Food manufacturers and employees need to be trained on personal hygiene.

References


Bağcı, T. 1997. Gıda Katkı Maddeleri ve Sağlığımız Üzerine Etkileri", Hacettepe Tıp Dergisi; 28(1); 18-23,

Beier, R.C. 1990. Natural pesticides and bioactive components in foods. Reviews of Environmental Contamination and Toxicology. 133: 47-123


Delen, N. 2003. Pesticides usages with examples from Turkey and possible risks of cancer. The first Reagional meeting of the APOCP, İzmir.


Lerner A., Matthias T. (2015). Changes in intestinal tight junction permeability associated with industrial food additives explain the rising incidence of autoimmune disease, Autoimmunity Reviews, 14, 6, 479-489


Smith, JM. 2007. Genetic Roulette -The Documented Health Risks of Genetically Engineered Foods, Yes Books, Iowa/USA,


URL 3: http://mtayar.uludag.edu.tr/VETHALK%20SAG.GG.htm


