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The most common causes of chemical food poisonings in humans

Food poisonings in humans may not only be induced by the consumption of food infected with pathogenic microorganisms but also by chemical factors as the infection may be caused by toxic mushrooms, some species of fruits and seeds and various chemical substances. The etiology of chemical poisonings includes organic and inorganic compounds of such elements as: lead, mercury, cadmium, zinc, arsenic, various solvents, dyes, medicines, acids, bases, phospho- and chloro-organic compounds and many other chemical substances used in industry and agriculture. Food poisonings may also result from accidental ingestion of substances used for disinfection, extermintion of insects and derivation or consumption of various kinds of liquids, e.g. alcohol. The substances and chemical compounds mentioned above may be ingested directly or in food or water contaminated by them; once in the organism, even in small doses, they are likely to cause poisonings whose consequences are sometimes worse than those of acute poisonings. The most common causes of chemical food poisonings are presented below.

HEAVY METAL POISONINGS

A heavy metal content exceeding the natural level is considered contamination. The metals which contaminate food may originate from containers, industrial equipment and various additives. Moreover, they are the components of pesticides, fertilizers, dyes, may be used as catalysts in food production. In general, heavy metal poisonings are rare, however, it should be stressed that some acute cases following the ingestion of high doses have been registered.

TOXIC PLANT POISONINGS

Many plants in our flora show toxic properties due to the presence of glycosides, alkaloids, saponins or other natural compounds. In some cases accidental consumption of leaves, fruits or seeds may result in death. Some weed seeds harmful for human health contaminate cereals, others may be consumed by persons unaware of possible sequels. However, the causes of higher plant poisonings are not always sufficiently explicable; in some cases allergens may be involved. At times, the causes should be sought in improper preparation of meals or similar appearance of plants or their parts, which are commonly consumed. In children, the most frequent poisonings are caused by *Atropa belladonna* or *Hyascyamus niger*. Food poisonings are likely to develop after the consumption of potatoes containing solanine, almonds, or of rhubarb as its oxalic acid binds calcium, which may lead to hypocalcaemia and tetany. Similar risks are associated with spinach, sorrel or even young beet leaves. Moreover, mycotoxins from naturally contaminated food and food products or drugs obtained by biotechnological processes are highly dangerous for human health.

CHEMICAL COMPOUND POISONINGS

The causes of chemical food poisonings are varied. In the days of unrestrained use of chemicals in our environment and food industry, these causes are often difficult to determine. Generally, it is assumed that every excessive substance present in food may result in poisoning.

Nitrates and nitrites occurring in food may have two sources. They may be purposefully used as additives or be food contaminants introduced with plant or animal raw materials and water. Nitrates and nitrites are used as preservatives in the production of meat and cheese. As contaminants they are mainly present in plants consumed directly by people or contained in animal fodder or water. They enter the animal organism with fodder or water and are found in tissues and secretions.

Plant diseases and pests are treated with numerous synthetic preparations called pesticides. Their worldwide use in many fields of human life creates many possibilities of poisonings and harmful effects. The pesticides used in agriculture include: insecticides, herbicides, fungicides, growth regulators and defoliants, i.e. substances used in various stages of plant food production. They become food contaminants once they are transmitted to preserved plants, from fodder to meat products and from fields to ground waters and water reservoirs, and consequently to drinking water. The extremely dangerous stable compounds are chlorinated hydrocarbons occurring in the soil and food products, which readily accumulate in human and animal organisms. In such situations even severe poisonings may be caused by many doses smaller than those resulting in immediate organism reactions. Moreover, there are cases of pesticides mixed accidentally with food as a result of their storage together with food products in households.

Polycyclic aromatic hydrocarbons also belong to the group of chemical compounds which may lead to food poisonings. These compounds are a special kind of contaminants which may be transmitted to food from the air, soil, water or due to some food processing procedures. They pass to the air as a result of vaporization of oil products or from internal combustion engines; from atmospheric air they get to the soil. The degree of soil contamination increases near the roads with heavy traffic or emission sources. The contamination is also likely to occur when crops are dried with combustion gases derived from oil. The recent studies demonstrated that food products, particularly animal ones, contained polychlorinated biphenyls (PCB) and veterinary drugs. In the environment, PCB are formed during combustion of industrial and municipal wastes, then pass to the atmosphere and are found everywhere – in water, food, animals and humans. The animal drugs are present in food due to their improper use, particularly with respect to the time required to excrete them from the organism.

MUSHROOM POISONINGS

Multi-fructification mushrooms widely available as food products, growing in forests or collected by various inexperienced persons but consumed also by other people or sold in the markets are a particularly important problem of food poisonings. When toxic species are mistaken for edible ones, their consumption leads to severe diseases which often result in death. It is commonly believed that mushroom poisonings are caused by the consumption of toxic mushrooms; however, it is not always true. Sometimes the edible mushrooms left in the conditions promoting the growth of microorganisms are also likely to lead to bacterial food poisoning as the meals containing them are excellent media for microorganisms. The mass poisonings are rare. Compared to other food poisonings, mushroom poisonings are characterized by higher mortality and significantly more severe clinical course. Their most common causes are mistakes in distinguishing the edible species from toxic ones. Toxic mushrooms contain cytotoxic and neurotrophic compounds as well as those irritating the alimentary tract. The incidence of mushroom poisonings ranges from 200 to 900 cases a year, hospitalization reaches 90%.

The only way to prevent them is to collect only well known edible mushrooms, promptly prepare and consume the meals containing them. The delayed consumption – several hours after preparation, should be avoided.

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SUMMARY

The aim of the paper was to characterize the chemical factors and their sources which are the most common causes of food poisonings in humans.

Najczęstsze przyczyny zatruć pokarmowych o etiologii chemicznej

Celem pracy było scharakteryzowanie czynników chemicznych i ich źródeł, będących najczęstszą przyczyną zatruć pokarmowych wśród ludności.