ASPECTS REGARDING THE ACTION OF FOREIGN SUBSTANCES IN FOOD

Daniela Cîrţînă
„Constantin Brâncuși" University of Tg-Jiu, Romania

ABSTRACT: *The complexity and diversity of chemicals added to food deliberately or illegally (in the case of contaminants) raises serious public health issues. The action of these compounds can have effects on the body in the short, medium and long term. The direct action on the body is manifested in the form of various disorders, taking into account the nature of the substances, but also the way they are transmitted. So, the process of assessing the potential risk to humans posed by food contaminants must be carefully managed and subject to the requirements of related legislation.*

KEY WORDS: food, foreign substances, action

1. INTRODUCTION

In the category of specific features of the harmful action of foodborne substances we can include their low concentrations, which normally cause chronic poisoning, with slow evolution, with low symptoms, sometimes difficult to interpret. Often, the consequences of intoxication appear obvious only in the case of substances with cumulative action, which can cause subacute or chronic manifestations. In addition, there are real difficulties in extrapolating and interpreting information and experimental toxicological conclusions of the acute type (the most commonly used research method for their study), in the case of chronic doses, dispersed and circulated in food [1].

So, a wide range of chemicals act in low or very low concentrations, in a completely different way than in high doses, this phenomenon being due to:
- adaptive reactions of the body, which in most cases has sufficient functional and organic reserves to cope with such aggression without showing signs of insufficiency;
- phasicity in action: modified compared to high doses;
- paradoxical actions, in the sense of the unexpected appearance or disappearance of symptoms or manifestations compared to acute intoxication;
- change in the dose-effect relationship after a long latency interval, which considerably complicates the epidemiological study or conclusions.

If we take into account the fact that the particularities related to the size of the doses are not strictly specific to the food, but can also be found in other environmental factors, the existence as a vehicle impresses certain aspects specific to the mechanism of action. So, it can be seen:
- interactions with food, taking into account his complex nature and the coexistence of factors that act conjugated or antagonistic to the toxicant.

- metabolism interdependent with other components of the food. For example, the presence of foods rich in protein, vitamins, can increase tolerance to some toxins, by increasing the ability to eliminate, detoxify and reactivity of the body. At the same time, other foods can facilitate the absorption or decrease resistance to toxins, as sometimes high-fat foods in hyperlipidic rations act [2].

Ingestion, and thus exposure to toxins, is difficult to evaluate over long periods of time, which can begin at birth, continuing until death, or on the contrary, can be episodic. The contamination process is difficult to monitor because food produced or polluted in certain regions can be shipped anywhere in the country or even abroad, making it difficult to determine the area where the pollution occurred. Moreover, they are consumed by healthy individuals and those who are ill or who, at the time of interaction with the harmful factor, are in special physiological conditions (exertion, growth, etc.), conditions that may increase their susceptibility to the action of the emissions and bring changes in the picture of intoxication, as well as its consequences [3].

In order for the evaluation process to have the expected results, it is necessary to examine not only the well-individualized compounds, but also their possible derivatives, resulting from the chemical interrelation with food constituents, or as a result of metabolic transformations in plant or animal tissue (subsequent destination of food). New compounds can have a less harmful action, but just as likely, more dangerous [4].

2. DIRECT HEALTH EFFECTS

Contamination of food with illegally added or introduced foreign substances has long been viewed with indulgence or even indifference. Often, the toxic potential was considered only to the extent that these substances caused obvious manifestations or endangered the life of the consumer. In other words, compared to acute or subacute toxicity, expressed quantitatively as LD_{50} or LD_{100} on various species of experimental animals. It was considered, by extrapolation, that a relatively low toxicity (according to LD_{50}) is not medically important. This conclusion has been brutally overturned, especially in recent decades, when a number of discoveries and a deeper understanding of the metabolic mechanisms that determine the toxicity, teratogenic, mutagenic or oncogenic activity of certain substances have finally made it clear that a strictly proportional relationship does not have to be required between the doses administered over time and the toxic potential of a substance, but it sometimes evolves independently, if not vice versa [4,5]. Here are some examples of this:

- among the HCH isomers, the most harmless are: α, β, δ, which have LD_{50} of the order of 3600-6000 mg/kilobody. More toxic is the gamma isomer, with LD_{50} of 150 mg/kilobody. However, recent research has shown that, in chronic intoxication, toxicity varies inversely, the beta isomer being 10 times more toxic than the gamma isomer, causing severe liver damage with fatty degeneration, outbreaks of necrosis and advanced cytological alterations;
- some food colorings, with a low toxicity from an acute point of view (LD_{50} = 3000 - 5000), have been shown to be strongly carcinogenic, causing liver, gallbladder, digestive neoplasms in experimental animals.
- certain fungicides with low acute toxicity have shown teratogenic action. Sodium cyclamate, which has an LD_{50} greater than 1000 mg/kilobody, is considered non-toxic and has been implicated as having teratogenic or oncogenic action etc [6,7].

It must also taking account that a number of chemicals may not be harmful in themselves but may facilitate the toxic

action of others or may simply not be tolerated by the body in some form processing. So, a number of emulsifying substances (polyoxyethylene, tweens, some detergents, etc.), used in pastry and bakery, as well as the fat industry, whose toxicity has been tested repeatedly and has been assessed as very low, become dangerous by promoting the absorption of oncogenes substances, which, in another context, were not retained in the body. Another suggestive example, illustrating the variety of possibilities by which food can undergo changes caused by technology, is modified starches, mechanically or enzymatically, in the sense of reducing the polysaccharide granule. It thus relied on obtaining organoleptically improved products with an increased digestive utilization coefficient for children's nutrition. However, a certain harmful action has been identified, with an insufficiently specified mechanism, due to the absorption without hydrolysis of the too finely divided polysaccharide, which causes allergic manifestations [8,9].

Following the analysis of these examples, is highlighted the degree of complexity of studying the consequences of the process of pollution and food industrialization and how unexpected its effects can be on the safety of products.

The consequences of the use of these contaminants for humans evolve in a very varied range also in terms of the nature of the toxicity and the extent, from the simple action of digestive or metabolic interference, to oncogenesis [9].

➢Specific and nonspecific anti-enzymatic action at the metabolic level. So, the "spoilage effect" can be mentioned by blocking the SH group of thiol enzymes when ingesting especially toxic metals, antivitamin action and, therefore, inhibition in this way of vitamin-dependent enzyme systems, anticholinesterase action, etc.

➢ Foreign substances can also act with "spoilage effects" by requiring detoxification mechanisms or "reserve" proteins. So, the stock of amino acids or the stock of purines (essential for the synthesis of nucleic acids) can be reduced. By spoiling such compounds, a cellular fragility can be reached, which determines, at the slightest nutritional or pathological imbalance, a true cellular necrosis. All these metabolic repercussions are concretely translated into a set of symptoms, depending on the extent and nature of the interferences. They are often nonspecific and affect the body's reactor potential, cause a slowdown in physical development, weight gain in growing organisms, apathy, decreased exercise capacity in adults or reduced immune potential in general.

➢ Organotropic action. So, a number of pollutants in food have a hepatotoxic action, causing functional liver disorders or even organized lesions. Alteration of the normal metabolism of the liver cell causes changes in hepatocellular enzymatic activity, in the concentrations of glycogen or hepatic lipids, in the protein and lipid metabolism with hepatosteatosis, up to hepatonecrosis. In simpler cases, there is only a decrease in functional capacity or a significant increase in sensitivity to other toxins or pathogens [9,10].

Similar lesions can occur in the renal tissue, as an organ of excretion of irritating compounds, insufficiently neutralized. The preference for a particular organ can sometimes be even more specific, depending, not on the route of entry, but on the chemical structure of the toxicant. So, vanadium usually accumulates in the kidneys, some antioxidants in fats and nerve tissue, as well as organochlorine products, lead and mercury in bones, thiourea and methylthiouracil in the thyroid, nitrous ion in red blood cells etc [10].

Other organs and systems affected by foreign substances, in varying proportions and incidences, are: nervous

system, hematoleukopoietic and endocrine. So, HCH, for example, causes lesions on the CNS, accompanied by electroencephalographic changes, influences hormonal secretion, etc. The adrenals are also affected by conditions of additional activity caused by the state of stress following intoxication or by a direct harmful action [9-11].

➢Allergizing action. It has been frequently described as a consequence of pollution in general and especially of the use of antibiotic or chemotherapeutic preparations, either for preservation purposes, or used as antibacterials or as antiprotozoarela in animal husbandry. Meat, milk or eggs from treated animals also contain residual amounts of chemicals that can cause sensitization.

➢ Mutagenic, teratogenic, oncogenic actions. The possibility of food contamination with these harmful substances, which cause serious biological disorders, is higher than with other components of the environment. In fact, some experts say that 80% of neoplasms caused by pollutants are achieved through food. The explanation consists in the great diversity of carcinogenic compounds that can appear in food or that come from the intentional addition of substances with malignant, mutagenic, teratogenic potential (of course due to ignoring this action). Interesting examples in this regard are sodium cyclamate used as a sweetener, preservative thiourea, safflower, various terpene compounds as flavorings, dimethylaminoazobenzene, fuchsin as a dye, etc. They were otherwise banned, but only when the harmful action was confirmed epidemiologically.

➢The potential carcinogenic action of contaminants that reach humans through food, such as some organochlorine pesticides, then aromatic polycyclic hydrocarbons, some metals (arsenic, selenium, etc.) should also be reported. These contaminants can be concentrated and retained in the environment by certain molluscs or fish, which accumulate, for example, polycyclic aromatic hydrocarbons or radioactive products such as: ^{65}Zn, ^{55}Fe, ^{90}Sr etc. However, carcinogens are formed in food and as a result of biological or chemical processes. Examples of this are nitrosamines made by the interaction of nitrogen ions with amines formed during the maturation of meat or meat derivatives, polymerized products obtained by overheating fats, polycyclic aromatic hydrocarbons, formed in bread ovens, by burning liquids etc [12,13].

3. CONCLUSIONS

The action of various contaminants on food and their direct influence on humans are considered to be a growing concern of today's society, given that by reducing the nutritional value and possibly by the occurrence of harmful substances, they are effectively removed from the biological circuit, food or nutritional factors that ensure a certain level of quality of life.

Prophylaxis of food contamination is difficult, given the growing demand for processed foods, obtained through complex technologies with a high risk of contamination. The iterative action of oncogenic noxious substances (means a cumulation of "effects" not necessarily of "quantities") suggests the harmfulness of small doses and, finally, the unusual prolongation of the latency period of carcinogenesis, thus making it difficult to establish an exact relationship experimentally dose-response.

All these considerations fully explain the advanced difficulty of the complete toxicological study, especially for substances present in low concentrations. Therefore, in order to ensure the guarantee of results with sustainable scientific value, long-term research is needed, supplemented with histoenzymological studies, molecular biology, genetics, immunochemistry, etc.

Keeping contamination within acceptable, minimum limits leads to a linear and consistent process in ensuring the quality and safety level of food that gives consumers confidence. By making products safe from the hygienic-sanitary point of view, a certain level of protection of the population's health is ensured and diseases are prevented whose negative effects affect the society as a whole.

The general rules of hygiene must be applied and observed at all stages of a food, from the raw material stage to the consumer. It is estimated that hygiene issues and their public awareness are fundamental to gaining and maintaining consumer confidence. In order to control the dangers, the government authorities imposed certain legal requirements in order to protect the health of the population.

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