eISSN: 2349-5715 pISSN: 2349-5707
Volume: 11, Issue 05, May-2024 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

ON SOME PROBLEMS OF CHEMICAL FOOD SAFETY AND WAYS TO ELIMINATE THEM

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Nutrition is one of the most important factors that ensures the connection of a person with the environment, creates conditions for the normal physical and mental development of a person, forms the systems of neutralization of foreign substances of a chemical, biological and physical nature, and ultimately determines health. Food is a rather complex complex of chemical compounds that includes not only important macro- and microelements and small biologically active substances, but also a large number of foreign substances with certain biological activity. According to the general literature, from 70 to 100 percent of individual environmental pollutants of a chemical and biological nature can enter the internal environment of the human body with food products.

Modern methodological approaches using the technologies of genomic and postgenomic methods (proteomics, metabolomics, nutrimicrobiomics, etc.) in recent years on the metabolism and mechanisms of action of important nutrients such as polyunsaturated fatty acids, squalene, polysaccharides made it possible to obtain radically new information, including vitamin D, calcium, selenium, etc., as well as small biologically active substances in food (flavonoids, carnosine, indole-3-carbinol, etc.). All this made it possible to clarify the norms of the human body's physiological need for nutrients and, in some cases, for the first time to determine the adequate and high permissible level of their consumption. At the same time, the development of an analytical base allows for the identification, identification and quantification of both new biologically active substances and new toxicants of natural and anthropogenic origin in food products. Extensive scientific research is being carried out on xenobiotics, which is aimed at revealing their metabolism and mechanism of action, as well as increasing the sensitivity of analytical methods for their detection in various food products, as well as in the biological environment of the human body. All this allows to determine or clarify the permissible daily dose or conditionally permissible weekly (monthly) intake, and to justify hygienic rules on the amount of contaminants in food products.

Based on this, the risk can be characterized in two positions: the risk associated with insufficient or excessive consumption of essential nutrients or their imbalance, and the risk associated with the introduction of food contaminants into the human body. Basically, all chemicals can be divided into two main groups. The first group includes nutrients that have been proven to be necessary for humans, but can cause toxic effects when consumed in high doses (selenium, fluorine, vitamins A and D, etc.). The second group includes substances that do not currently have proven physiological significance and are natural components of the natural environment (toxic elements, mycotoxins, phycotoxins, etc.) or by chemical, microbiological, biotechnological or other means (pesticides, polychlorinated biphenyls, dioxins, melamine, antibiotics and other veterinary drugs, etc.). They can enter the human body with food, water and air. In addition, their content can vary significantly in each specific environment. Thus, mycotoxins are practically only found in food raw materials and food products, while pesticides can enter the human body with food, water and air. It is also important to consider that intakes of essential nutrients in sufficient or excessive amounts can significantly influence the manifestation of the toxic effects of "real" pollutants. This can manifest itself as an increase or decrease in the toxic effects of pollutants or changes in the metabolism of other important nutrients, which leads to their secondary deficiency and thus to an increase in the

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toxicity of xenobiotics. In other words, we are talking about changing the effects of the toxic effects of pollutants in conditions where the human body is not optimally supplied with essential nutrients.

In accordance with the requirements accepted in international and national practice, the establishment of hygienic standards is carried out on the basis of the procedure for assessing the risk to public health. This includes, inter alia, summarizing all available information on toxicological, hygienic and medical-biological studies conducted in experiments using modern methodological approaches and analytical methods, studying and evaluating the actual composition of the substance and its metabolites in food products. . Using this methodology, only in recent years, in a number of countries, work has been carried out on the assessment of the risk to public health as a result of the consumption of ractopamine from food livestock products, the residual amount of tetracycline antibiotics in food products, and the justification of permissible doses. Nitrates in plant products, assessment of public health risk associated with intake of L. monocytogenes with certain types of food products.

In addition to regulated contaminants, there is a risk of introducing known and new toxicants into food products. Currently, the world literature is paying serious attention to the issues of inorganic arsenic in food products, the composition and regulation of some phycotoxins, and reducing the consumption of aluminum from food products.

Arsenic is one of the environmental pollutants and is present in various inorganic and organic forms in food products. Currently, inorganic forms of arsenic (arsenates, arsenites, arsenic trioxide, arsenic pentoxide) have been proven to have the most toxic, neurotoxic and carcinogenic effects (according to the publications of the International Agency for Research on Cancer, inorganic arsenic belongs to the 1st group of carcinogens, its organic derivatives (as arsenobentine, arsenosugars, arsenolipids, methyl arsonate, dimethyl arsinate, etc.), according to the world literature, it is less toxic and almost does not undergo metabolism in the body Standards for inorganic arsenic in water and some foods have also been established. Levels of arsenic (in all forms) are found in seafood, rice, mushrooms and poultry. There are also reports of detection of inorganic arsenic in cattle tissues associated with the use of veterinary drugs and feed additives. However, due to the lack of real data on the content of inorganic arsenic in food products, it is problematic to calculate the daily burden of a person. Data on the total intake of arsenic from water and food products for the population of 19 European countries showed that its consumption ranged from 0.13 to 0.56 μg/kg per day for the entire population and from 0.37 to 1.22 μg/kg of body weight. weight per day for 95% of consumers. The obtained information is based on the analysis of arsenic content in the main food groups (cereals and cereal products included in the mixture of food products for young children, rice and nutrients made from rice, coffee, beer, mineralized water) and their consumption values. In the case of high consumption of rice by some groups of the population, the intake of inorganic arsenic in the human body can reach 1 μg/kg of body weight per day. At high levels of algae consumption, inorganic arsenic intake is approximately 4 μg/kg body weight per day. At the same time, the study of the content of inorganic arsenic in food products is based on the study of unprocessed food products, mainly raw food products.

Aluminum is the most abundant metal in the lithosphere (8% of the earth's crust), and it can enter the human body with water and food. The amount of aluminum in unprocessed foods is less than 5 mg/kg of product, but the content of various aluminum compounds in processed foods depends on many factors, such as the method of water treatment, the type of packaging materials, and the use of food additives. will depend. Therefore, a high concentration of aluminum (from 5 to 10 mg / kg) is bread, confectionery bakery products, some types of vegetables (spinach, radish, lettuce, corn

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salad), mushrooms, glazed fruits, dairy products, boiled sausage , found in domestic products, seafood. However, the highest levels of aluminum were found in loose leaf and bagged tea, herbs, cocoa and cocoa products, and spices. At the same time, the bioavailability of various aluminum compounds is 0.1% (from food) - 0.3% (from water). Studies conducted on animals have shown that when various aluminum salts are introduced with food, it is detected in almost all organs and tissues, but about half of the aluminum consumed with food accumulates in bone tissue. In addition, there is evidence that aluminum crosses the placental barrier and is found in breast milk. 90% of aluminum in blood plasma is bound to transferrin and about 10% to citrates, therefore, as the amount of aluminum in the tissues increases, the amount of iron in the body decreases. Calcium and magnesium deficiency also contribute to the accumulation of aluminum in brain tissue and bones. In recent years, experiments have shown that a number of aluminum compounds in high doses have negative effects on the reproductive system of dogs and have neurotoxicity in mice and rats. Taking into account the new toxicological data, in 2007 a new indicator - 0-1 mg/kg of body weight, in 2011 - for aluminum - 0-2.0 mg/kg of body weight/week was established. According to WHO estimates, the average intake of aluminum for the human body from all possible sources varies from 11 to 136 mg/person per week. At the same time, it has been shown that a significant contribution to the total consumption of aluminum belongs to food additives containing aluminum, which are currently approved for use in the food industry. According to the evaluation of the European Food Safety Authority, depending on the considered scenario, the consumption of five aluminum food additives (E 523, E 541, E 554, E 556 and E 559) by the population was taken into account. . different age groups (young children, children, adolescents, adults, elderly) averaged from 2.3 to 76.9 mg/kg of body weight per week and for 95% of the population from 7.4 to 145.9 mg/kg per week can be up to Thus, it has been shown that aluminum intake in aluminum-containing food supplements may exceed safe levels of intake from all established sources. The obtained data became the basis for the exclusion of food additives potassium aluminosilicate (E 555) and bentonite (E 558) from the list of "General Standard for Food Additives" (Codex Stan 192-1995) .

Despite the establishment of monitoring of phytotoxin contamination of aquatic organisms in many countries of the world, the regulatory and methodological base for these pollutants has not yet been fully formed in Russia. Thus, at present, TR CU 021/2011 "On the safety of food products" defines the standards of content of saxitoxin, domoic acid and okadaic acid, which are in full compliance with international values and with appropriate methods of their determination. is mounted. In the documents of the Codex Alimentarius Commission, as well as in the legislation of a number of countries (European Union, USA, Japan, Australia and New Zealand, etc.), then in the Russian Federation and the countries of the Customs Union, there are no officially approved methods for determining these phycotoxins.

When considering new risks, it should be noted that food products contain a large amount of biologically active substances, their excessive consumption can lead to negative consequences for human health. In particular, such substances include protein poisons (ricin, abrin, flammulin, amanitin, phalloidins, volvotoxin A, centlatoxins A and V, foratoxin, viscotoxins, etc.), various alkaloids and biogenic amines, glycosides and saponins, peptide hydrolysis products, plant toxins. (amygdalin, enatoxin, etc.), a large number of toxins of microbiological origin, red bean phytohemagglutins, plant lectins, substances migrating from packaging materials (phthalates, bisphenol A, etc.), etc. The relevance of this problem is currently determined by the use of aromas, extracts and flavorings from traditional and exotic plants, which may contain biologically active substances such as agaric acid, beta-asaron, alloin, in the food industry. , including hypericin,

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capsaicin, coumarin, menthofuran, methyl eugenol, safrole, estragole, etc. As a rule, their content in plants is very low, and with traditional use in food, they do not pose any danger. However, when extracting plant extracts, the concentration of these substances in them increases many times, and therefore they must be strictly controlled in the final product. The problem is that all these substances have not yet developed analytical methods for their detection, and many have not yet been toxicologically evaluated.

In this article, only some issues of food toxicology were discussed. In fact, the problem is more complicated. The use of modern analytical methods makes it possible to identify and identify more and more new substances, which, in turn, requires their complete toxicological evaluation, the discovery of their metabolism and mechanism of action, and the need to determine the need for their regulation in food products. does.

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