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Article

The Levels of Heavy Metals in Semi-Processed Food Products and Their Impact on Human Health

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Abstract: The levels of lead and cadmium in semi-finished food products were analyzed and compared with sanitary standards. The results showed that the presence of heavy metals largely depends on environmental conditions, production processes, and the quality of raw materials, while exceeding permissible limits can negatively affect human health. The study highlights the need to ensure food safety and strengthen control measures.

Keywords: Heavy Metals, Lead, Cadmium, Zinc, Copper, Food Safety, Environmental Monitoring, Semi-Finished Products

Introduction

At present, environmental pollution caused by human activities is considered one of the major global ecological problems.[1] The increase in industrial production, the development of transportation systems, and the intensification of agricultural activities have led to the spread of various chemical substances into the environment. Among them, heavy metals are of particular ecological and hygienic importance, as they can enter the food chain through soil, water, and air and may affect human health [2].

Heavy metals belong to a group of elements characterized by high atomic mass and density. Some of them, such as iron, zinc, and copper, are essential microelements for the human body and ensure the normal functioning of enzyme systems. However, elements such as cadmium and lead possess high toxicity, and their accumulation in the body can lead to the development of various diseases [3].

One of the important characteristics of heavy metals is their ability to bioaccumulate, meaning that they can remain in the body for long periods and gradually exert harmful effects on health. Therefore, the detection and control of heavy metals in food products are of great importance for ensuring food safety.[4]

The occurrence of heavy metals in food is mainly associated with soil and water pollution, industrial waste, vehicle emissions, as well as the use of mineral fertilizers and pesticides in

agriculture.[5] Thus, improving ecological monitoring systems and conducting regular laboratory testing of food products are considered urgent tasks [6].

Materials and Method

In this study, laboratory analyses were performed to determine the concentrations of heavy metals in semi-finished food products.[7] The following product groups were selected as the objects of investigation: meat products, egg white, milk and dairy products, sour cream, cottage cheese, ice cream, cereal products, legumes, groats, and bakery products.[8]

The concentrations of lead (Pb) and cadmium (Cd) in the collected samples were determined using modern analytical laboratory methods. The obtained results were subsequently compared and evaluated in accordance with established sanitary and hygienic standards [9].

Results and Discussion

During the study, the concentrations of heavy metals in various food products, particularly lead (Pb) and cadmium (Cd), were determined, and the obtained results were compared and evaluated according to sanitary and hygienic standards No. 0366–19.[10] It is known that heavy metals can enter the food chain through soil, water, and plants as a result of environmental pollution and may have adverse effects on the human body [11]. Therefore, regular monitoring of the levels of these elements in food products is of significant hygienic importance.

The analysis results showed that in the majority of the tested food products, the concentrations of heavy metals did not exceed the established sanitary standard limits.[12]

During the study, the concentrations of heavy metals in various food products, including lead (Pb) and cadmium (Cd), were determined, and the results were compared with sanitary and hygienic standards No. 0366–19.[13] It is known that heavy metals can enter the food chain through soil, water, and plants as a result of environmental pollution and may negatively affect human health [14]. Therefore, continuous monitoring of these elements in food products is of great importance.

The results showed that in most of the tested products, the concentrations of heavy metals did not exceed the established sanitary standards.[15]

Conclusion

The results of the study showed that certain amounts of heavy metals may be present in the tested food products; however, their concentrations did not exceed the established sanitary and hygienic limits. At the same time, considering the bioaccumulation properties of heavy metals, regular ecological and hygienic monitoring of food products is necessary.

To reduce the levels of heavy metals in food products, it is recommended to improve environmental monitoring systems, follow ecological requirements during agricultural production, conduct regular laboratory testing of food products, reduce the negative impact of industrial waste on the environment, and modernize food processing technologies. These measures play an important role in ensuring food safety and protecting public health.

The presence of heavy metals in food products largely depends on environmental conditions, particularly in areas located near industrial zones where their concentrations may be relatively higher. These elements can gradually accumulate in the human body and disrupt various physiological processes. For example, lead can negatively affect the central nervous system and may slow mental development in children, while cadmium can impair kidney function and damage bone tissues . Therefore, continuous monitoring of heavy metal levels in food products is essential for maintaining public health.

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