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Review Article

Heavy metals in livestock products (milk and red meat)

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Heavy metals, recently with the increase in population and the increase in the birth rate in many areas, as well as the need of different groups for various resources have a significant increase, and in this aspect, it can increase every day. This issue directly exposes our food sources, especially milk and animal meat. The results in various reports and research clearly state that these food sources are contaminated in many cases and this contamination can easily enter the food cycle of humans by eating these products. In this paper, with a brief overview, we have tried to examine the topic through scientific reports, and at the end, we suggest that the land where animal feed is grown be far from metal industries and factories, and also, we can plant some herbs that accumulate more because these plants have the ability to remove pollution.

Key words: *heavy metals, livestock products, milk, red meat, pollution*

Introduction

In this regard, it should be mentioned that pollution in terms of its presence in water and soil sources, due to the entry of many illegal and unhealthy chemical compounds into the cycle of water systems, is of great concern. With the increase in the population of different countries as well as the increase in its rate in third world and developing countries, it is obvious that the housing density has also increased and the sewage systems of these areas must also be increased, which creates an inequality level and is worthy of consideration. Considering the complexity and importance of the issue, it is clear to everyone that the presence of sewage causes a lot of damage to the environment, fisheries, tourism and drinking water sources. Therefore, the thing that has a major contribution to the development of national and regional health is perhaps preventing the pollution of surface water sources as the main source of drinking water used by humans (Alinia-Ahandani et al., 2022). According to various statistics and reports regarding the increase in the use of heavy metals in industries and agriculture, there have been many concerns about environmental pollution, and high concentrations of heavy metals in various agricultural and food sources cause serious damage to plants, has also entered the food cycle of humans. Increasing pollution of heavy metals in various environments, including the environment and nature, for reasons such as erosion of agricultural lands, urban waste, rural activities, industrial activities and mining industries has increased the concerns of the world, especially developing countries.

Heavy metals in many reports that have been mentioned in the field in the Middle East, America, East Asia and Europe countries, in elements such as cadmium, mercury, lead, chromium, arsenic, nickel, there are differences from the aspect of distance or proximity to the sources. Pollution in agricultural products such as fruits, vegetables have shown that it naturally exists in other cases such as animal fodder, plants and other items and enters the human life cycle through the consumption of meat, milk and other derivatives. Although there are some reports that indicate the

low level of arsenic and nickel or some metals and other elements in the reports, but still with the rise of the industrialization process, these values will also go towards danger (Alinia-Ahandani et al., 2023). In this regard, it should be said that heavy metals do not have the ability to be metabolized in the body, and their accumulation is more in different tissues of the body, which will be the basis of many cases and problems, which are confirmed by various reports (Anetta et al., 2012). The increase and spread of various kinds of viruses, bacteria and infections in the body is also one of the most common cases of more than the permissible amount of these elements in the body. One of the very strange cases of the negative function of these elements is replacement with useful and essential elements of the body, which affects the metabolic cycle of the body. Among these cases, it can be said that it is deposited in tissues such as veins, muscles and bones, or in the case of zinc deficiency in the diet, cadmium replaces it in the body (Alinia-Ahandani et al., 2023; Korish and Attia, 2020).

Due to the increasing contamination of water and soil sources, there is a risk of contamination of plants as a source of food for animals, therefore feeding animals from the polluted environment containing heavy metals can introduce a large percentage of these metals into the animals' bodies. We know that heavy metals are not metabolized in the body, thus causing the contamination of animal products, especially the red meat we consume (Kaplan et al., 2011; Anetta et al., 2012). What should be done to solve this problem? In the following, we offer a solution to have a healthy and green diet. Of course, it is clear and obvious that the widespread effects of toxic elements on different parts of the human body have been proven, and this is done through different methods that are being updated and more accurate every day. It should be noted that the older methods, although they were correct in many cases, could not be used for a large part of the published information in different places, but now we can compare many reports in recent years in, for example, ICP-OES and atomic emission. and examine a wide range of essential and toxic elements about a region in terms of several factors (Tabinda et al., 2013). In this short review article, we discussed the necessity of examining these toxic elements in food, especially milk and meat, according to various reports, and at the end, with the suggestions and points mentioned, the needs of investigation through different methods were stated.

Materials and methods

We reviewed many articles and found that heavy metal contamination was found in many animal sources such as meat and milk. In the following section, we will review the results of the studies and provide a solution to deal with heavy metals.

Results and Discussion

Few studies have been done regarding the contamination of milk and its products with heavy metals. In 2016, researchers conducted a study on four types of milk (raw milk - pasteurized milk - dry milk and mother's milk) for contamination with metals such as nickel, lead, copper and cadmium using the atomic absorption method of 2% of the samples. The investigation showed that all the samples have percentages of heavy metal contamination (Alinia-Ahandani et al., 2023; Tajkarimi et al., 2008). In relation to the residual amount of cadmium and lead in 180 liver and kidney muscle samples from 60 cows slaughtered in Isfahan, the average of the residual cadmium in all samples was found to be lower than the acceptable limit of the European Union. 5 samples of muscle, 3 samples of liver and 9 samples of kidney were more than allowed (Korish and Attia, 2020; Shaheen et al., 2016). It should be mentioned in a special way that the effects expressed in various articles that report the harms of heavy metals (toxic and non-toxic elements) include the effects of harmful physiological and non-physiological effects that have an impact on cell metabolism and also the effects it puts a very significant negative on the oxidative effects on biological macromolecules, which are on nuclear proteins and DNA.

Of course, it should also be remembered that heavy metals in very small and permissible amounts have essential effects on physiological and biochemical functions and play a vital role in many basic structures of living organisms, and of course if they are of specific and permissible standards. They cause many problems and their toxicity will cause carcinogenic and non-carcinogenic diseases, and it is completely accepted that the poisoning is caused as a result of the dysfunction and cellular function of living organisms. It should also be mentioned in this section that the reference and origin of pollution in heavy metals are different between different elements and these effects depend on the type of soil, water, nutrition and atmosphere of the region that include the food cycles and the duration of the investigation. In various research reports, it has been shown that the highest accumulation of toxic elements in meats

and meat products was in cases where they originated from environmental and natural pollution, and all reports, of course, allow a percentage of toxicity that is higher than that. They have warned as pathogenic (Korish and Attia, 2020).

Conclusion

According to the results of the studies, we observed that the contamination of heavy metals can directly cause contamination of soil, water and plants, that animals can be contaminated as a result of feeding on plants and can be a source of heavy metals that consume products such as meat and let these contaminations reach our body. We suggest that fodder be grown in lands away from metal industries and factories, and surrounding agricultural lands be planted with high-accumulative plants to store possible contamination in their roots and shoots. In the end, we suggest that the soil of the agricultural lands be analyzed for the presence of heavy elements every few years and then the livestock food is planted in it again. And every year, randomly, the milk and meat of the animals whose food is supplied from the target lands should be evaluated for the presence of heavy elements.

Author contributions

Ebrahim Alinia-Ahandani & Sahebeh Hajipour: Conceptualized and written this review and edited the manuscript. Zeliha Selamoglu: Providing a solution for the Materials, edited the manuscript and approved for publication.

Competing interest

The authors have declared that no conflict of interest exists.

Ethics approval

Not applicable.

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