World Academy of Science, Engineering and Technology
International Journal of Nutrition and Food Engineering
Vol:19, No:05, 2025

Evaluation of Heavy Metal Contamination in Sausages, Mortadella, and Hamburgers from Various Iranian Companies: Health Risk Assessment and Sources of Contamination

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Abstract : Global concerns regarding food safety and quality, especially in the wake of industrial development and increasing environmental pollution, are expanding rapidly. One of the primary concerns is the contamination of meat products such as sausages, mortadella, and hamburgers with heavy metals, which may be transferred to these products from various sources, including environmental pollution, metallic equipment, and protective coatings. Protective coatings, such as metal cans and packaging layers, especially under conditions such as corrosion, high temperatures, or long-term storage, can act as primary sources for the transfer of heavy metals to these products. Metals such as lead (Pb), cadmium (Cd), and tin (Sn) are among the contaminants that can enter food products from these sources. This study was conducted to assess the level of heavy metal contamination in 200 samples of sausages, mortadella, and hamburgers produced by various companies. The samples were randomly collected from local markets and production sites and were then processed using an acid digestion method combined with nitric acid and hydrogen peroxide. The concentration of heavy metals was measured using atomic absorption spectrometry (AAS). The results of this study showed that the average concentrations of lead, cadmium, and tin were 0.08, 0.03, and 110 mg/kg, respectively, and in 15% of the samples, the levels of lead and cadmium exceeded the maximum allowable limits set by the WHO (0.1 mg/kg for lead and 0.05 mg/kg for cadmium). The data were analyzed and compared using ANOVA and independent T-tests in SPSS software. Additionally, to assess the health risk for consumers, the Hazard Quotient (HQ) was calculated, which was found to be above the acceptable limit (HQ > 1) in some samples, indicating potential risks to consumer health. These findings emphasize the need for more rigorous monitoring of production processes, packaging, and raw material selection to prevent contamination with heavy metals in food products.

Keywords : heavy metal contamination, health risk assessment, sources of contamination, various Iranian companies
Conference Title : ICFBS 2025 : International Conference on Food and Beverage Safety
Conference Location : Vancouver, Canada
Conference Dates : May 15-16, 2025