



Research Paper

Evaluation of Lead, Arsenic and Cadmium in Poultry Meat Sold in Tehran, Iran

Mahdi Jafari¹, Ebrahim Rahimi^{2*}

¹Ms.C. Department of Food Hygiene, Shahrekord Branch, Islamic Azad University, Shahrekord, Iran

²Professor, Department of Food Hygiene, Islamic Azad University, Shahrekord Branch, Shahrekord, Iran

*Corresponding author: Ebrahim Rahimi, Email: ebrahimrahimi55@yahoo.com

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Extended Abstract

Introduction

Poultry meat is a major source of essential nutrients, including high-quality proteins, amino acids, minerals, and vitamins. However, contamination with heavy metals such as lead (Pb), arsenic (As), and cadmium (Cd) can pose serious health risks to consumers. Heavy metals are introduced into poultry meat through environmental pollution, feed contamination, and water sources. Chronic exposure to these toxic elements has been linked to various health disorders, including neurological, cardiovascular, renal, and carcinogenic effects. Despite strict regulatory guidelines, heavy metal contamination in food products remains a major public health concern. This study aims to assess the levels of Pb, As, and Cd in poultry meat available in Tehran and evaluate their compliance with national and international safety standards.

Methods

A total of 45 poultry meat samples, including 15 samples each from chicken, turkey, and quail, were randomly collected from five supply centers in District 12 of Tehran, Iran. The samples consisted exclusively of breast meat, which was immediately stored at -18°C until analysis. Heavy metal concentrations were determined using atomic absorption spectrometry

(AAS) after acid digestion. The digestion process involved treating 200 grams of each sample with concentrated nitric acid (65%) and hydrogen peroxide (35%), followed by heating at 160°C for four hours. After cooling and filtration, the samples were diluted with deionized water and analyzed for Pb, As, and Cd concentrations. The results were statistically analyzed using one-way ANOVA and Tukey's post hoc test at a significance level of $p < 0.05$.

Results and Discussion

The mean concentrations of heavy metals detected in the poultry samples were as follows:

- **Quail meat:** Cd: 0.04 mg/kg, as: 0.07 mg/kg, Pb: 0.108 mg/kg
- **Chicken meat:** Cd: 0.748 mg/kg, as: 0.43 mg/kg, Pb: 0.717 mg/kg
- **Turkey meat:** Cd: 0.569 mg/kg, as: 0.08 mg/kg, Pb: 1.184 mg/kg

Statistical analysis revealed significant differences in heavy metal concentrations among different poultry species ($p < 0.05$). The highest levels of Pb were detected in turkey meat (1.184 mg/kg), followed by chicken (0.717 mg/kg) and quail (0.108 mg/kg). Similarly, Cd levels were highest in chicken meat (0.748 mg/kg), while as concentrations were highest in chicken meat (0.43 mg/kg). All detected levels exceeded the permissible limits set by national and international food safety standards, raising concerns about potential health risks for consumers. Comparison with previous studies indicates that the contamination levels in poultry meat from Tehran are considerably higher than those reported in some other regions. For instance, studies conducted in India and China have reported lower levels of Pb, Cd, and as in poultry meat. However, similar contamination levels have been observed in studies from Pakistan and Nigeria, highlighting the global nature of this issue. The elevated heavy metal levels in the present study could be attributed to feed contamination, water quality, and environmental pollution in poultry farms. The health implications of heavy metal exposure are alarming. Pb is known for its neurotoxic effects, particularly in children, and can cause developmental disorders, anemia, and kidney damage. Cd exposure is associated with renal dysfunction, osteoporosis, and carcinogenic effects, while as is a known carcinogen linked to skin lesions, cardiovascular diseases, and neurological disorders. Given the chronic nature of heavy metal accumulation in the human body, prolonged consumption of contaminated poultry products may pose severe long-term health risks.

Conclusion

The findings of this study indicate that poultry meat sold in Tehran contains heavy metal concentrations exceeding national and international safety standards. The highest contamination levels were observed in turkey meat, followed by chicken and quail. Given the potential health risks associated with Pb, Cd, and as exposure, urgent measures are required to monitor and regulate heavy metal contamination in poultry products. Strengthening regulatory frameworks, improving feed and water quality controls, and implementing routine surveillance programs can help mitigate this issue. Further research is recommended to identify contamination sources and develop effective strategies for reducing heavy metal exposure in the food supply chain.

Keywords: Lead, Cadmium, Arsenic, Food, Meat

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