REVIEW ON ADULTRATION OF ANIMAL ORIGIN FOOD

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Abstract: The adulteration of food of animal origin refers to the intentional or unintentional contamination, substitution, or addition of inferior or harmful substances to animal-based food products. This can happen during the various stages of production and distribution, including farming, processing, and handling. Adulteration can involve the addition of contaminants, substitution of ingredients, mislabeling or misrepresentation, contamination during handling or storage, or engagement in illegal or unethical practices. It poses significant health risks to consumers, leading to foodborne illnesses, allergic reactions, or long-term health issues. To combat this issue, governments, regulatory bodies, and food industry stakeholders implement measures to ensure the integrity and safety of animal-based food products through inspections, testing, and enforcement of food safety standards and regulations.

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1. Introduction

In recent years, consumers have become more concerned about the quality and safety of food products and have become keenly interested in knowing more about food authenticity and food fraud. In other words, consumers demand more complete information about their food, including what they are really buying, where the food comes from, and when and how it was produced. Although fraud and adulteration have been practiced since ancient times, it is only in recent years that food authenticity issues have been more exposed, and public attention has been intensively paid to the magnitude of this problem and the serious consequences of food fraud (Denezis et al.,2016; Mcgrath et al.,2018).

Furthermore, during the current pandemic period with coronavirus raging around the world, affecting every aspect of life, including food choices and nutrition habits, consumers have become even more concerned about safety, accessibility, affordability, and the origin of food products than any time before.

This increased interest in food authenticity may also be explained by the numerous food scandals over the last few years (e.g., horse meat scandal in 2013 and rotten meat from Brazil in 2017) and the increased consumer awareness about the impacts of food fraud in terms of illegal economic gain, as well as negative effects on the public health and the environment.Non etheless, several recent studies have indicated that fraud or mislabeling is still a wide spread practice, especially in food products of animal origin, which are often considered among the most frequently adulterated foods (Delpia *et al*., 2020; Sotelo *et al*.,2018; Chawtorn *et al*.,2018; Robson *et al*.,2020).

Market globalization and increases in international trade, driven by fewer obstacles to the export and import of food, a complex food production chain, and the complex nature of food products of animal origin, the huge variety of these products, as well as the emergence of tricky and more sophisticated forms of fraud are some of the reasons that could explain this rise in food fraud and why detection and prevention are challenging tasks (Florinoetal.,2018; Gihini et al.,2019;Leal *et al*.,2015;Cyedt *et al*.,2020).

Fraud in animal origin products can take many forms, including mislabeling of the provenance (geographical or botanical origin), species substitution, discrepancies in the production method and farming or breading technique, addition of non-declared substances, as well as fraudulent treatments and non-declaration of processes, such as previous freezing, irradiation, and micro wave heating . To support this review and obtain the research published in the last few years on the authenticity of food products of animal origin, Scopus data base was queried in May 2020, using the keyword “authenticity” or “authentication” and the different categories of animal origin food products. It can be noticed that a huge amount of studies dealing with authenticity and detection of fraud in fish, meat, milk, honey, and eggs has been published in recent years; the number of published works increased from 530 between 2010 and 2014 to 1000 between 2015 and 2012.

2. Milk and Dairy product adulteration

Milk and dairy product adulteration came into global concern after breakthrough of melamine contamination in Chinese infant milk products in 2008 (Lietal., 2015). However, history of milk adulteration is very old. Swill milk scandal has been reported in 1850 which killed 8000 infants in New York alone (How we poison our children 1858). Milk is considered to be the 'ideal food' because of its abundant nutrients required by both infants and adults. It is one of the best sources for protein, fat, carbohydrate, vitamin and minerals.

Unfortunately milk is being very easily adulterated throug hout the world.Possible reasons behind it may include-demand and supply gap, perishable nature of milk, low purchasing capability of customer and lack of suitable detection tests, (Xinetal.,2008). The motivationfor food fraud is economic, but the impact is a real public health concern (Kanthamiaetal.,29).The situation is significantly worse in developing and underdeveloped countries due to the absence of adequate monitoring and lack of proper law enforcement. Qualitative detection of adulterants in milk can be easily performed with chemical reactionswhile quantitative detections are complex and diverse.

Type of quantitative detection techniques depend on the nature of adulterants inmilk. For example, LC (Liquid Chromatography) and ELISA (Enzyme Linked Immunosorbent Assay) are the most common techniques used to detect foreign protein; PCR (Polymerase Chain Reaction) and PAGE (Polyacrylamide Gel Electrophoresis) are usually used to detect milk from different species as adulterants in milk of a particular species. Milk adulteration detection techniques need to be very specific and rapid, because defrauders have escaped condemnation claiming less effectiveness of the conventional detection technique (Garcia *et al*.,2012).

3. Milk adulteration with Urea

Urea, being a natural constituent of milk, constitutes the major portion of non-protein nitrogen in milk. According to FSSAI act 2006 and PFA rules 1955, maximum allowable limit for urea in milk is 70 mg/100 mL(Sharma *et al*.,2012).

Milk can be adulterated with urea in two ways – by intentional addition of urea and by addition of unspecified synthetic milk to natural milk.

Near infrared Raman spectroscopy has been used to quantify the presence of urea without requiring any preprocessing (Khan *et al*.,2014) LC has been used to quantify urea as adulterant in milk (Dai *et al*.,2013)A method based on GC/IDMS (Gas Chromatography/Isotope Dilution Mass Spectrometry) has been used to quantify urea present in milk (Xinhua *et al*.,2010). HPLC has been reported to detect the presence of natural urea in milk with a suggestion to convert the urea into a derivative containing a chromaphore before HPLC analysis.

4. Adulteration in meat

Definition: Adulteration is done with the knowledge of the produce for more profit and quantity.

Types of Adulteration

2.1 Intentional: Adulteration is done with the knowledge of the producer for more profit and quantity.

2.2 Unintentional: The adulteration is done unknowingly. For example, some reaction while preparing, out dated food, residual, pesticides, rodent droppings etc.

3. Chemical: A type of adulteration which is done by the means of chemicals is known as Chemical Adulteration.

4. Biological: A type of adulteration which is done by the means of microorganism is known as biological Adulteration.

5. Adulteration In Meat

There are various kind of adulteration which we can see in meat and meat products.

• Addition of water, Addition of ice, Dead animal meat, Haram animal meat, Limitation.

• Mixing of different organ in Sausages/Nuggets and Unhealthy animal meat.

6. Addition of Water

The addition of water is the most common practice which we seen in our daily routine . It is use for increase the weight of the meat by adding water pressure into the tissues of the slaughtered animal. It is also know as pressure meat.

7. Addition of Ice

The addition of the ice also one of the technique which is use to gain the weight of meat. In which meat is placed into the crushed ice and absorbing water from its environment by means of osmosis.

8. Dead animal meat

Selling of dead animal meat who were die by means of any disease or any accident instead of slaughter once to overcome the loss of cattle farms done by intentionally for earn good amount.

9. Imitation Meat

A meat analogue, also called a meat alternative, meat substitute, mock meat, faux meat, imitation meat, vegetarian meat, fake meat, or vegan meat, approximates certain aesthetic qualities (such as texture, flavor, appearance) or chemical characteristics of specific types of meat.

10. Mixing of different organ

Different organs like tongue, heart, liver, kidney etc were added to the mince of beef while making nuggets, sausages, burger patties etc to increases the quantity of meat or to get a better color and texture as per requirement.

11. Causes of Adulteration

High demand, lowering the cost of the product to compete with the market. gain profit , Lack of trained men .Outdated processing techniques , Not aware of its effects. Effects of Adulteration is injurious to health, It causes many diseases, also causes deficiency diseases as it disables us to get the real nutrients of the quality products. It causes children deficiency in health and mental ability. It causes new diseases in our body like cancer, damage to digestive tract, liver and stomach disorders. It doesn't allow enhancing the product.

12. Laws against Adulteration

Federal food and cosmetic drug act of 1938 first introduced the idea of prevention of food adulteration. In 1954,The Prevention of Food Adulteration act was passed which enforced the previous laws which was against adulteration. In 2004,these laws were again enforced and the punishments were increased.(Osama,2023).

13. Conclusion and Recommendations:

- Animal-based foods are a rich source of essential nutrients such as protein, iron, vitamin B12, and omega-3 fatty acids.
- Consuming animal-derived foods in moderation can be part of a balanced and healthy diet.
- Choose lean sources of animal protein such as poultry, fish, and lean cuts of meat to minimize saturated fat intake.
- Incorporate a variety of animal-based foods to ensure a balanced intake of nutrient.
- Consider the environmental and ethical aspects of animal agriculture and opt for sustainable and ethically sourced animal products when possible.
- Balance animal-based foods with a variety of plant-based foods to ensure a well-rounded diet.
- Consult with a healthcare professional or registered dietitian to determine the specific dietary needs and requirements based on individual health conditions and goals.

14. Reference

1. Cawthorn D.M., Baillie C., Mariani S. Generic names and mislabeling conceal high species diversity in global fisheries markets. *Conserv. Lett*. 2018;11:1–12. .
2. Creydt M., Fischer M. Food authentication in real life: How to link nontargeted approaches with routine analytics?
3. Danezis G.P., Tsagkaris A.S., Camin F., Brusic V., Georgiou C.A. Food authentication: Techniques, trends & emerging approaches. TrAC-Trends Anal. Chem. 2016;85:123–132. doi: 10.1016/ j.trac.2016.02.026.
4. Dai X, Zhao Y, Li M, Fang X, Li X, Li H, Xu B. Determination of urea inmilk by liquid chromatography-isotope dilution mass spectrometry.*Analytical Letters.* 2013;45:1557–65.
5. Delpiani G., Delpiani S.M., Deli Antoni M.Y., Covatti Ale M., Fischer L., Lucifora L.O., Díaz de Astarloa J.M. Are we sure we eat what we buy? Fish mislabelling in Buenos Aires province, the largest sea food market in Argentina. *Fish.Res*.2020;221:105373.doi:10.1016/j.fishres.2019.105373.Electrophoresis. 2020:1–15. .
6. Ellis DI, Brewster VL, Dunn WB, Allwood JW, Golovanov AP, Goodacre R.Fingerprinting food: current technologies for the detection of food adulteration and contamination. *Chem Soc Rev*.2012;41(17):5706–27.
7. Fiorino G.M., Garino C., Arlorio M., Logrieco A.F., Losito I.,Monaci L. Overview on Untargeted Methods to Combat Food Frauds: A Focus on Fishery Products. *J. Food Qual*. 2018;2018.
8. Garcia JS, Sanvido GB, Saraiva SA, Zacca JJ, Cosso RG, Eberlin MN. Bovine milk powder adulteration with vegetable oils or fats revealed by MALDI-QTOF *MS. Food Chem*. 2012;131(2012):722–6. 131 722–726..
9. Ghidini S., Varrà M.O., Zanardi E. Approaching Authenticity Issues in Fish and Seafood Products by Qualitative Spectroscopy and Approaching Authenticity Issues in Fish and Seafood Product by Qualitative Spectroscopy and Chemometrics Products by Qualitative Spectroscopy and Chemomet. Molecules. 2019;24:1812. .

10. Khan KM, Krishna H, Majumder SK, Gupta PK. Detection of urea adulteration in milk using near-infrared Raman spectroscopy. Food Anal. Methods. 2014.
11. Kamthania M, Saxena J, Saxena K, Sharma DK. Methods of Detection &Remedial Measures. Int J Engg Tech Res. 2014;1:15–20.
12. Leal M.C., Pimentel T., Ricardo F., Rosa R., Calado R. Seafood traceability: Current needs, available tools, and biotechnological challenges for origin certification. Trends Biotechnol.2015;33:331–336.
13. Li L., Boyd C.E., Sun Z. Authentication of fishery and aquaculture products by multi-element and stable isotope analysis. *Food Chem.* 2016;194:1238–1244.
14. McGrath T.F., Haughey S.A., Patterson J., Fauhl-Hassek C., Donarski J.,Alewijn M., van Ruth S., Elliott C.T. What are the scientific challenges in moving from targeted to non-targeted methods for food fraud testing and how can they be addressed?Spectroscopy case study. *Trends Food Sci. Technol*.2018;76:38–55..
15. Robson K., Dean M., Brooks S., Haughey S., Elliott C. A 20-year analysis of reported food fraud in the global beef supply chain. *Food Control. 2020;116:107310.*
16. Sharma R., Rajput Y. S., Barui A. K., & N., L. N. Detection of adulterants in milk, A laboratory manual. In N. D. R. Institute (Ed.)). *Karnal132001*,
17. Xin H, Stone R. Tainted milk scandal. Chinese probe unmaskshigh-tech adulteration with melamine. Science. 2008;322:1310–1.*Haryana, India. 2012*
18. Xinhua Dai XF, Fuhai S, Yang M, Li H, Zhou J, Xu R. Accurate analysis o urea in milk and milk powder by isotope dilution gas chromatography– mass spectrometry. *J Chromatogr B. 2010;878: 1634–8*.