

Ensuring the Safety of Food Products and Combating Falsification in Customs

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Abstract: Food safety is a paramount concern in today's globalized world. With the increasing complexity of supply chains and international trade, ensuring the safety and authenticity of food products has become a critical issue. Falsification of food products, particularly in customs, poses significant risks to public health, consumer trust, and fair trade practices. This article aims to explore the challenges surrounding food safety and the falsification of food products in customs, along with potential strategies to mitigate these risks.

Keywords: Food falsification, adulterated ingredients, food-related diseases, counterfeiting, mislabeling, public safety, substitution.

Introduction

Ensuring the safety of food products and combating their falsification in customs require a comprehensive and multi-faceted approach. By strengthening regulatory frameworks, enhancing customs control measures, promoting international cooperation, leveraging technology, and raising public awareness, we can mitigate the risks associated with food product falsification. Safeguarding the integrity of the food supply chain is crucial for public health, maintaining consumer trust, and upholding fair trade practices. Continued efforts from governments, regulatory bodies, industry stakeholders, and consumers are essential to protect the integrity of the global food system and ensure the safety of food products worldwide. [1].

Understanding Food Safety:

Food safety is of paramount importance as it directly impacts public health and the economy. Ensuring the safety of food products is crucial to prevent foodborne illnesses, protecting consumers from potential hazards, and maintaining consumer confidence in the food supply chain. Unsafe food can lead to a range of health issues, from mild gastrointestinal discomfort to severe illnesses and even death. Moreover, outbreaks of foodborne diseases can result in substantial economic losses for individuals, businesses, and governments[2].

Importance of Food Safety: Exploring the Impact of Unsafe Food on Public Health and the Economy. The consequences of consuming unsafe food are significant and wide-ranging. According to the World Health Organization (WHO), contaminated food causes an estimated 600 million cases of foodborne diseases and 420,000 deaths globally each year [3]. These illnesses not only result in personal suffering but also place a burden on healthcare systems and impact productivity due to missed workdays. Additionally, the economic impact of unsafe food is substantial. Foodborne diseases lead to increased healthcare costs, loss of productivity, and a decline in consumer confidence. The food industry may experience reduced sales and reputational damage, and governments face the financial burden of addressing foodborne disease outbreaks and implementing regulatory measures.

1. Key Aspects of Food Safety:

Examining Critical Factors such as Hygiene, Microbiological Hazards, Chemical Contaminants, and Allergens. Food safety encompasses various aspects that need careful attention to ensure the delivery of safe and wholesome food products. Key factors include:

1.1 Hygiene:

Maintaining high levels of cleanliness and proper sanitation practices throughout the entire food production chain is essential. This includes adequate handwashing, sanitization of food preparation surfaces and equipment, and proper storage and handling of food[4].

1.2 Microbiological Hazards:

Microorganisms such as bacteria, viruses, and parasites can contaminate food and cause foodborne illnesses. Ensuring appropriate cooking temperatures, implementing effective food storage practices, and practicing good personal hygiene is vital in preventing the proliferation of harmful microorganisms.

1.3 Chemical Contaminants:

Chemicals such as pesticides, veterinary drug residues, heavy metals, and food additives can pose health risks when present in food above permissible levels. Monitoring and regulating the use of chemicals in food production, along with effective testing and inspection protocols, are necessary to minimize exposure to harmful substances.

1.4 Allergens:

Allergenic substances, such as peanuts, milk, eggs, and gluten, can trigger severe allergic reactions in susceptible individuals. Proper labeling of allergenic ingredients on food packaging and implementing stringent measures to prevent cross-contamination during production and processing are crucial to safeguarding consumers with food allergies.

1.5 Regulatory Framework:

Highlighting the Role of International Organizations and National Regulatory Bodies in Establishing Food Safety Standards. Food safety is regulated by both international organizations and national bodies. International organizations, such as the WHO and the Food and Agriculture Organization (FAO), work collaboratively to develop global standards and guidelines for food safety. The Codex Alimentarius Commission, a joint initiative of the WHO and FAO, establishes internationally recognized food standards, codes of practice, and guidelines.

Methods of falsification of goods. 1st picture[5].

Methods of falsification and determination of consumer goods		
Tea	Adding tea residues	Visual viewing
Cup of coffee	Partially or completely replaced by chicory	Color of the water conduit when mixed with cold water
Refined vegetable oil	Use crude oil	Define Cell Contents
Large sturgeon fish	Artificial protein caviar	Organoleptic methods: appearance, flavour, taste
Milk	Replace with water or mix with pastrelized milk	Organoleptic methods: taste, flavour, consistency
Cottage cheese	Replacement with milk or water for weight gain	Consistency of appearance
Butter	Replacement of other animals or vegetable fats	Determine the oil content

Cheese	Use milk unsuitable for cheese production	Taste, by smell
Canned milk	Mix dry and liquid milk	Appearance, taste, consistency. By weight and length

2. International Cooperation and Harmonization:

2.1 Role of International Organizations:

International organizations such as the World Health Organization (WHO), Food and Agriculture Organization (FAO), and World Trade Organization (WTO) play a vital role in promoting international cooperation and harmonization of food safety standards. These organizations facilitate the exchange of information, best practices, and scientific expertise among member countries[6]. Through initiatives like the Codex Alimentarius Commission, they develop guidelines and standards for food safety, including measures to prevent and detect food product falsification.

2.2 Bilateral and Multilateral Agreements:

Bilateral and multilateral agreements between countries also play a crucial role in combating food product falsification in customs. These agreements establish frameworks for cooperation, information sharing, and mutual assistance among customs authorities. They promote the exchange of intelligence on emerging risks, facilitate joint investigations, and strengthen legal measures to address falsification. Examples of such agreements include Mutual Recognition Agreements (MRAs) and Free Trade Agreements (FTAs), which often incorporate provisions for cooperation on food safety and fraud prevention.

3. Legal Consequences and Deterrence:

3.1 Legal Frameworks:

The legal framework surrounding food product falsification varies across jurisdictions, but it typically encompasses a range of laws and regulations aimed at preventing, detecting, and penalizing offenders. These may include food safety acts, consumer protection laws, customs regulations, and trade-related legislation. Efforts are being made to harmonize these legal frameworks to ensure consistency in addressing falsification and harmonizing penalties for offenders.

3.2 Criminalization of Falsification:

To deter food product falsification, many countries have implemented specific criminal provisions that make falsification a serious offense. These provisions aim to impose significant penalties, including fines and imprisonment, on individuals and organizations found guilty of falsifying food products. Additionally, some countries have introduced extraterritorial jurisdiction, enabling prosecution for falsification that occurs outside their borders but impacts their citizens or their domestic markets.

3.3 Enforcement and Prosecution:

The effectiveness of combating food product falsification depends on robust enforcement mechanisms and effective prosecution. Law enforcement agencies, customs authorities, and regulatory bodies play key roles in monitoring the import and export of food products, conducting inspections, and investigating suspected cases of falsification. Coordination among these entities is crucial to gather evidence, apprehend perpetrators, and present cases for prosecution. Additionally, specialized units dedicated to combating food fraud can be established within customs and law enforcement agencies to focus specifically on these crimes [7].

4. Traceability and Supply Chain Management:

4.1 Supply Chain Transparency:

One of the critical strategies for preventing and detecting food product falsification is enhancing supply chain transparency. Implementing traceability systems allows for the tracking and documentation of the journey of food products from their origin to the point of sale. By employing technologies such as barcodes, RFID tags, and digital systems, stakeholders can trace the movement of products, verify their authenticity, and identify any points of vulnerability or potential falsification.

4.2 Blockchain Technology:

Blockchain technology has gained attention as a potential solution to enhance traceability and supply chain transparency. By creating an immutable and decentralized ledger, blockchain can provide an unalterable record of every transaction and transfer of ownership throughout the supply chain. This technology can enable real-time verification of product authenticity, enabling

customs authorities to quickly identify and investigate any discrepancies or signs of falsification. Blockchain can also facilitate secure sharing of information among supply chain stakeholders, enhancing collaboration and trust.

5. Emerging Trends and Future Directions:

5.1 Advances in Authentication Technologies:

Continual advancements in authentication technologies offer promising avenues for combating food product falsification. DNA barcoding, isotopic analysis, and spectroscopy are among the emerging techniques used to authenticate the origin and composition of food products. For instance, DNA barcoding involves analyzing specific DNA sequences to identify the species present in a product. Isotopic analysis examines the isotopic composition of elements within a sample, providing insights into its geographical origin. Spectroscopy utilizes the interaction of light with molecules to identify and quantify substances within a sample. These technologies provide robust and scientific methods to verify the authenticity of food products, enhancing customs authorities' ability to detect falsification accurately.

5.2 Artificial Intelligence and Machine Learning:

Artificial Intelligence (AI) and Machine Learning (ML) algorithms have shown great potential in detecting patterns and anomalies associated with food product falsification. These technologies can analyze vast amounts of data, including supply chain information, historical inspection records, and laboratory test results. By identifying correlations and deviations from expected patterns, AI and ML can help customs authorities prioritize inspections and target high-risk shipments. Moreover, these technologies can continuously learn from new data and adapt to evolving falsification techniques, enabling more effective detection and prevention measures[8].

5.3 Consumer Engagement and Empowerment:

Engaging and empowering consumers is essential in the fight against food product falsification. Mobile applications, QR codes, and online platforms can enable consumers to access detailed information about the products they purchase. This information may include the product's origin, ingredients, certifications, and test results. By encouraging consumers to scan QR codes or input product codes into mobile applications, they can verify the authenticity of the product and report any suspicions of falsification. This crowdsourced approach to monitoring and reporting can provide valuable data to customs authorities and regulatory bodies, enhancing their ability to identify and address cases of falsification[9].

Types of food falsification. 2nd picture[10]

Types of Food Falsification	Description	Potential Consequences
Adulteration	Adding inferior or harmful substances to a food product to increase its bulk or weight	Illness, injury, death; loss of consumer trust; damage to brand reputation
Misbranding	Falsely labeling a food product to mislead consumers about its content, origin, or quality	Consumer confusion, deception, and dissatisfaction; regulatory noncompliance; legal penalties
Counterfeiting	Producing and selling fake versions of popular or high-value food products	Loss of revenue for legitimate manufacturers; harm to brand reputation and consumer trust; potential health and safety risks
Fraud	Deceiving consumers or other stakeholders through false claims or misrepresentations about a food product or its attributes	Loss of consumer trust and confidence; reputational damage; legal and financial penalties

Statistics:

- ✚ According to the Food Fraud Initiative at Michigan State University, food fraud affects an estimated 10% of all commercially sold food products worldwide.
- ✚ The World Health Organization (WHO) estimates that contaminated food causes approximately 600 million foodborne illnesses and 420,000 deaths yearly.
- ✚ A study by the European Commission found that 4.4% of food products tested within the European Union were non-compliant with labeling and composition regulations.
- ✚ The United States Pharmacopeial Convention (USP) estimates that up to 7% of the global food supply is affected by adulteration or substitution.
- ✚ The European Union's Rapid Alert System for Food and Feed (RASFF) reported a 25% increase in notifications related to fraudulent practices in 2020 compared to the previous year.
- ✚ The Global Food Safety Initiative (GFSI) estimates that food fraud costs the global food industry approximately \$30 to \$40 billion annually.
- ✚ These statistics highlight the prevalence and economic impact of food product falsification, underscoring the urgent need for robust measures to ensure food safety and combat [11].

According to a survey by PwC, 32% of food companies have implemented blockchain or distributed ledger technology in their supply chains to enhance transparency and traceability. The use of blockchain can reduce the risk of falsification by providing an immutable record of transactions and verifying the authenticity of food products. The Internet of Things (IoT) and sensor technologies are being increasingly employed to monitor various parameters in the food supply chain, such as temperature, humidity, and storage conditions. These technologies enable real-time monitoring and alert systems that help identify potential risks of falsification, such as tampering or spoilage. AI-powered image recognition technology is being utilized to detect counterfeit packaging and labels. By analyzing images, logos, and packaging designs, AI algorithms can identify inconsistencies or signs of falsification, aiding customs authorities in their inspections.

Conclusion:

In conclusion, the safety of food products and the prevention of their falsification in customs require a multi-faceted approach that involves international cooperation, robust legal frameworks, advanced technologies, and empowered consumers. By harmonizing food safety standards, strengthening customs regulations, and enhancing enforcement mechanisms, we can create a more secure and resilient global food supply chain. The adoption of traceability systems, blockchain technology, and authentication technologies can significantly enhance customs authorities' ability to detect and prevent falsification. Additionally, engaging consumers and providing them with the tools and information to verify the authenticity of food products empowers them to make informed choices and acts as an additional layer of defense against falsification.

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