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Ensuring Food Safety through Effective Supply Chain Management: Challenges and Suggestions

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Abstract:

Ensuring food safety is a complex challenge exacerbated by the global nature of modern supply chains. Effective supply chain management plays a crucial role in safeguarding food. This paper explores the concerns of food safety that causes by unethical food supply chain. Case studies from both developed and developing regions illustrate successful initiatives and highlight lessons learned. The role of collaboration among stakeholders—producers, processors, distributors, regulators, and consumers—is emphasized as crucial for effectively managing risks and ensuring compliance with safety standards throughout the supply chain. This essay examines how supply chain issues affect food safety through three case studies: China's oil scandal mixing edible and chemical oils, the 2022 U.S. peanut butter recall due to salmonella contamination, and antibiotic-contaminated Vietnamese shrimp amid Japan's nuclear water release. Each case underscores the impact on public health and trust. By examining three current cases, this paper aims to provide a comprehensive understanding of how ineffective supply chain management can create food safety risks and reduce consumer confidence in the safety and integrity of the food supply chain and suggest possible course of action.

Keywords: Food safety; supply chain; quality control; traceability.

1. Introduction

Ensuring food safety has become a common concern in an increasingly globalized and complex food system. With the rise of international trade, supply chains have expanded beyond national borders. This connection has introduced numerous challenges, from managing food safety risks associated with diverse sources and varied production practices to maintaining regulatory compliance across different areas.

On a macro level, food safety is influenced by a broad spectrum of factors. The World Health Organization and various national health agencies report that foodborne illnesses remain a significant public health issue, affecting millions worldwide annually. At a micro level, effective supply chain management encompasses the planning, and each stage presents unique challenges that can impact the overall safety of the food supply.

This essay will explore the relationship between supply chain management and food safety through the three case studies, each highlighting different aspects of how supply chain issues can compromise food safety. The first case study examines the mixed use of tankers for edible and chemical oil happened recently in China, a reminder of how lack of quality control and unethical practices within the supply chain can lead to public health concerns. The scandal involved the mixing of tanker shipments edible and chemical oils, caused sales to fall and caused a decline in public confidence in food safety.

The second case study focuses on the 2022 U.S. peanut butter recall, which highlights the challenges of detecting contamination in food products. The outbreak of salmonella traced back to a single peanut processing facility illustrates the difficulties of maintaining safety standards across the supply chain. This case highlights the importance of robust quality assurance measures to prevent and respond to contamination events. On the other hand, ensuring awareness and proper disposal practices is crucial to preventing illness from contaminated products.

Finally, the third case study combines antibiotic-contaminated Vietnamese shrimp and a reduction in fish exports caused by Japan's release of nuclear water. This reveals how errors in internationally traded food supply chains can undermine the trust of consumers in other countries, thereby damaging their own countries. Moreover, due to such a scandal, both countries have lost part of their interests, especially in terms of reputation and economic.

By examining these case studies, this essay aims to illuminate the critical role of effective supply chain management in insuring food safety and offer suggestions for improving safety to better protect public health.

2. Case Study 1: Fuel Tankers Transporting Cooking Oil in China

2.1 Overview

Recently, China has been embroiled in a controversy involving the mixed use of tankers for transporting edible and chemical oils [1]. Investigations revealed that some tankers, originally designed to transport chemical oils, were also being used to transport edible oils for human consumption. The practice, which was found to be widespread, has raised significant concerns about food safety and public health.

When regulatory authorities conducted routine inspections and discovered evidence that the same tankers had been involved in transporting both types of oils without proper cleaning or disinfection procedures between uses. Chemical oils, which can include substances like industrial oils, are often contaminated with residues that are harmful to human health if ingested. The contamination of edible oils with these residues represents a serious risk of foodborne illness and toxic exposure [2].

2.2 Public Reaction

Beijing News has discovered loopholes in the whole process of bulk transportation of edible oil. In the opinion of many tanker drivers, the reason why owners do not arrange to wash the tanks is more due to the fact that some edible oil manufacturers are not strict in gate-keeping. They usually do not check whether the tanks are clean or not. The cost of a single wash can be as little as 300 to 500 yuan, or as much as 800 or 900 yuan [1].

Another reason is that with the increase in the number of tankers in the past two years, competition has intensified, and train drivers can only make profits by lowering prices. However, facing increasing prices of living, many fuel oil tankers have had to find ways to dispense goods on their return journeys, such as transporting edible oil.

For edible oil industries, they lack scrutiny of tanker trucks. Fuel oil tanks can easily cope with the scrutiny of the edible oil companies by, for example, using previously taken photographs and wiping the mouths of bottles that will be inspected. Loose management systems and the pursuit of low cost and high efficiency make public health negligent, and business becomes unethical.

2.3 Consequence

Economically, several Chinese edible oil companies are suffering. On July 10, Yihai Kerry Arawana Food Group Co Ltd, a private company, shares opened down more than 8% at one point. As of the close of trading on July 10, Hainan Jingliang Holdings Ord Shs, which is a state-owned company, holdings fell 5.84%, hitting a new low in nearly four years [3]. Both state-owned and private companies have suffered from the anger of the public in this case.

On the other hand, imported cooking oil has an increasing sales trend. On Taobao, one of China's largest online shopping platforms, sales of Nissin's cooking oil skyrocketed, accompanied by other brands such as Olivolia and Kirkland. This not only reflects the importance that a large number of Chinese families place on food safety, but also their distrust of domestically produced cooking oil.

The company also took immediate action in response to the incident. Sinograin removed edible oil products from its Jinding brand from online flagship stores. Both Sinograin and Hopefull Grain and Oil Group stated that investigations were underway. Other major edible oil manufacturers not named in the report issued statements denying the use of fuel trucks for transporting their products.

In response to the scandal, the Chinese government has intensified its regulatory oversight and implemented stricter enforcement measures to ensure that food safety standards are upheld [4].

3. Case Study 2: 2022 U.S. Peanut Butter Recall

3.1 Overview

In 2022, a significant food safety incident occurred in the United States involving a large-scale recall of peanut butter products. The outbreak was linked to products manufactured by the J.M. Smucker Company at their facility in Lexington, Kentucky [5]. The recall was initiated due to the detection of salmonella contamination in several batches of peanut butter produced by a major manufacturer. Salmonella, a pathogen known for causing severe gastrointestinal illness, poses serious health risks, particularly to vulnerable populations such as children, the elderly, and those with weakened immune systems. The recall was triggered when routine testing by the manufacturer revealed the presence of salmonella in several batches of peanut butter. This discovery led to a broad recall affecting numerous brands and products distributed nationwide [6].

3.2 Consequence

The initial recall of Jif peanut butter products led to a cascade of recalls affecting at least 69 other products. This was due to the widespread use of Jif peanut butter as an ingredient in various foods, including chocolates, snack packs, and bakery items. Companies such as Del Monte, Albertsons, and others had to recall their products, which were distributed nationwide and in several other countries [7].

In addition, the recall had a financial impact on the J.M. Smucker Company, initially projected to negatively affect adjusted earnings per share by 90¢. However, the company managed to recover quickly, reducing the impact to

80¢ per share, partly due to insurance recoveries and pricing actions.

As the recall was initiated due to a Salmonella outbreak linked to the peanut butter, it resulted in 14 reported illnesses across 12 states. The Centers for Disease Control and Prevention (CDC) noted that the actual number of cases might be higher, as many people recover without medical attention [8].

Finally, the recall prompted increased scrutiny and regulatory actions from the Food and Drug Administration (FDA) and CDC. J.M. Smucker implemented corrective measures at their facility, including equipment repairs and enhanced sanitation, to prevent future contamination.

3.3 Course of Actions

The event went through a collaborative effort that saved the vast majority of people from this health issue.

Firstly, the manufacturer identified the contaminated batches and issued a recall notice to retailers and consumers. The J.M. Smucker Company voluntarily recalled a selection of Jif peanut butter products on May 20, 2022, due to potential Salmonella contamination. This decision was made out of an abundance of caution to ensure consumer safety. Consumers were advised to check the lot codes on their Jif products to determine if they were affected. Products with specific lot codes were identified as potentially contaminated, and consumers were instructed to dispose of these products immediately [9].

Still, the company committed to reimbursing consumers for the recalled products. Consumers could contact the company through a dedicated website or phone number to coordinate reimbursement.

On the other hand, the company identified an equipment issue that allowed water to enter the production environment, potentially introducing bacteria. They took corrective actions by repairing the equipment, destroying contaminated products, and conducting extensive cleaning and sanitation throughout the facility.

However, a class action lawsuit was filed on behalf of consumers nationwide who purchased the contaminated products. The lawsuit aimed to hold the company accountable for promoting products that were unsafe for consumption [10].

4. Case Study 3: Contamination of Vietnamese Shrimp and Reduction in Japanese Fish Exports

4.1 Overview of Vietnamese Shrimp Contamination

The issue of antibiotic contamination in Vietnamese shrimp has been a significant concern due to its environmental and health implications. The problem arises from the extensive use of antibiotics in shrimp farming, which has led to the contamination of coastal wetlands and the presence of antibiotic residues in exported shrimp [11].

In Vietnam, shrimp farming has rapidly expanded, particularly in coastal wetlands, leading to environmental challenges. The use of antibiotics in these farms is prevalent, and residues have been detected in wastewater, sediments, and surrounding ecosystems. This contamination poses risks such as the development of antibiotic-resistant bacteria, which can have broader ecological and health impacts [12].

The contamination has not only affected local ecosystems but also international trade. The U.S. Food and Drug Administration (FDA) has frequently refused shipments of Vietnamese shrimp due to the presence of banned antibiotics. In 2015 alone, the FDA reported refusing 38 entry lines of Vietnamese shrimp for this reason, marking it as a significant year for such refusals since 2002 [12]. Similar concerns have been noted by other countries, including Canada, the European Union, and Australia, which have also reported issues with antibiotic residues in Vietnamese shrimp imports.

4.2 Overview of Reduction in Japanese Fish Exports

The primary reason for the reduction in Japanese fish exports is China's ban on Japanese marine products. This ban was implemented in response to Japan's decision to release treated radioactive water from the Fukushima Daiichi nuclear power plant into the Pacific Ocean. China has labeled this water as "nuclear contaminated" and has suspended all imports of Japanese seafood [13]. In fiscal 2023, Japanese seafood exports to China fell by 57%, from 74.6 billion yen in fiscal 2022 to 32 billion yen. This marked the largest decline since comparable data became available in fiscal 1988. The ban led to an immediate 76% drop in shipments to China, with significant reductions in the export of products like crab, salmon, and bonito [14].

In response to the ban, Japan has been actively seeking new export destinations to reduce its dependency on China. Countries such as Brazil, Singapore, and the United States have become new targets for Japanese seafood exports. The United States, for instance, became Japan's largest seafood export destination in fiscal 2023 [15].

The Japanese government and industry stakeholders have been promoting Japanese seafood in various international markets. Initiatives include hosting events to showcase the quality of Japanese marine products and exploring processing opportunities in countries like Mexico for the U.S. market.

Overall, the decline in exports to China has had a significant economic impact on Japan's seafood industry, which

is a crucial part of the country's agricultural, forestry, and fisheries export strategy. The situation has prompted Japan to reconsider its export strategies, focusing on rebranding its products as "safe and high quality" and expanding into new markets. This strategic shift is seen as essential to achieving long-term growth targets and reducing vulnerability to geopolitical tensions.

4.3 Compare and Contrast

The two events of antibiotic contamination in Vietnamese shrimp and the reduction in Japanese fish exports are significant in the context of international trade and environmental impact.

Both events are caused by environmental issues. The antibiotic contamination in Vietnamese shrimp is linked to the environmental damage caused by shrimp farming, including the destruction of coastal wetlands and the development of antibiotic-resistant bacteria. Similarly, the reduction in Japanese fish exports is partly due to environmental concerns related to the release of treated radioactive water from the Fukushima nuclear plant, which has led to international apprehension.

Both events have significantly impacted international trade. Vietnamese shrimp exports have faced rejections from countries like Japan and the United States due to antibiotic residues. In the case of Japanese fish, exports to China have drastically reduced due to the ban on Japanese seafood following the Fukushima water release.

On the other hand, two countries have different response to the identical cases. Japan has sought to diversify its export markets to mitigate the impact of the Chinese ban, targeting countries like the United States and Brazil. In contrast, the response to the Vietnamese shrimp issue involves addressing environmental practices and improving regulatory oversight to prevent antibiotic misuse.

Overall, the reduction in exports affects the economic stability of the seafood industry in both countries, prompting a reevaluation of trade strategies and market diversification to sustain economic growth.

5. Challenges of Ensuring Food Safety in Food Supply Chain

5.1 Lack of Quality Control

The scandal in China involving the mixed use of tankers for edible and chemical oils underscores how inadequate quality control can compromise food safety. Regulatory bodies must be well-resourced and vigilant to enforce compliance and prevent violations. There have been insufficient checks to ensure that the practices adhered to food safety standards. The incident also highlighted a failure in the proper segregation and cleaning of tankers used for different types of cargo. Ensuring effective cleaning protocols requires both proper training and investment in cleaning technologies.

5.2 Detection and Prevention of Contamination

The U.S. peanut butter recall manifest that the difficulty in detecting contamination. The outbreak of salmonella was traced back to a single peanut processing facility, but detecting the contamination was challenging. Salmonella can be present in low levels that are hard to detect, especially if it's not consistently tested for in all batches. But only advanced testing technologies and protocols can identify contaminants in low concentrations, which are enough to cause illness. Ensuring that these methods are effectively implemented and regularly updated to detect emerging threats is a constant challenge.

5.3 Unethical Practices

The use of tankers for both chemical and edible oils suggests a deliberate evasion of safety regulations. Tanker drivers are ignoring and bypassing safety standards to cut costs or expedite processes. All stakeholders must be held accountable for violations, which requires robust regulatory frameworks and resources for enforcement. Moreover, this practice reflects a broader issue where financial incentives overshadow ethical considerations. Ensuring adherence to regulations even in cost-cutting scenarios is essential but difficult.

5.4 Coordination Across Complex Global Supply Chains

In the case of Vietnam and Japan, both countries failed to meet the food requirements of major exporting countries, such as the United States and China. This led to a massive reduction in exports and destabilized their economies. At the same time, it also tells the food production and exporting countries that they should not only care about their own production standards, but also consider the requirements and expectations of their targets.

5.5 Crisis Management and Response

Crisis response is well demonstrated in the cases of the United States and Japan. In the peanut butter recall world, Jif responded extremely quickly and apologized, while beginning to recover the product and offer compensation. The Japanese government immediately found a replacement buyer after losing China as the main buyer, thus stabilizing the loss-making fishermen.

6. Strategies to Ensure Food Safety in Supply Chain

To ensure food safety through effective supply chain man-

agement, it is important to implement strategies. Many times, people can avoid this health hazard before it happens, thus the priority is to make it preventive rather than remedial measures. Delving into each of these areas can help prevent contamination and ensure compliance with safety standards. The goal is a robust system that minimizes risk throughout the entire supply chain.

6.1 Training and Supports

Although many mistakes in the food industry are unavoidable faults that lead to huge crises, but there are still many mistakes that can be avoided with advance training and education. The first point is to make every food industry employee aware of the importance of the food industry and the zero tolerance for mistakes at every step of the process. Still using the China example, if a tanker driver knows that mixing oil has a high potential to endanger others, even those close to the driver, he will not care about the small profits. Companies in the food industry should also give some financial assistance to low-wage employees. Unlike other industries, it is easy for small mistakes in the food industry to lead to irreversible consequences, creating negative externalities. It is essential to ensure no mistakes and high-quality control on hygiene.

6.2 Continuous Improvement of Food Quality Requirements

Continuous improvement in food quality is paramount for ensuring consumer safety. By regularly updating safety protocols and refining production processes, food manufacturers can prevent contamination and reduce the risk of foodborne illnesses. Vietnam and Japan have lost one of their largest markets because of their inability to meet the high demands of their major buyers. Regular review and enhancement of quality measures ensure that safety concerns are promptly addressed, creating a safer food environment and reinforcing the commitment to consumer well-being. When Japan and Vietnam raise their own requirements for exporting food, such as reducing antibiotic injections or filtering nuclear wastewater instead of discharging it, they will not leave their countries' economies unstable.

6.3 Building-up a Traceability and Transparency System

Both the events in the US and China demonstrate the importance of traceability systems. The peanut butter recall in the U.S. was a result of an effective traceability system that allowed the product to be recalled before more people were harmed. And the tanker mix-up in China was also due to the failure to implement a reliable traceability system for transportation, relying instead on a single tanker driver with a less than stellar code of ethics to transport cooking oil. This has led to major accidents involving the mixing of cooking oil and industrial oil. In this incident, many netizens pointed out that a positioning system could be installed on the tanker trucks to make sure that no more mix-ups would occur, which is one. This is also the most direct traceability system. This allows for swift identification of potential issues and effective recall management if necessary.

In addition to traceability, transparency is important. In addition to traceability, transparency is important. It remains the case that in China, without the journalists' reports, perhaps such failures would have continued for many more years. Transparency here is the linkage and communication of multiple aspects throughout the supply chain, such as the fully transparent cooperation between producers and the transportation chain, to ensure that food is safe and held uncontaminated at every step of the way. This will foster open communication with all stakeholders to ensure that any potential issues are addressed collaboratively and proactively.

7. Conclusion

In conclusion, ensuring food safety in an increasingly globalized supply chain presents significant challenges, including inadequate quality control, difficulty in detecting contamination, and unethical practices. Case studies from China, the U.S., and Vietnam illustrate the severe repercussions of these issues, from public health risks to economic losses. Addressing these challenges requires a multifaceted approach, but all should be addressed in advance rather than after they occur. Enhancing training and support for industry workers can prevent errors, while continuous improvement in food quality standards and regulatory compliance is crucial. Building robust traceability and transparency systems will aid in swiftly identifying and managing potential issues, as evidenced by successful recall efforts and improved safety practices. Ultimately, a proactive and integrated strategy is essential to protect public health and maintain trust in the food supply chain.

This essay is limited by its focus on only three case studies, which may not encompass the full range of global food safety challenges. Additionally, it lacks a detailed examination of the effectiveness of proposed strategies, thus requires more in-depth evaluation of their real-world applicability and success rates. It lacks citations from academic literature and is simply a reflection and improvement based on the events that occurred. This will make the essay lack enough evidence to support it and make the recommended weak. The analysis might also overlook the nuanced impact of cultural and economic factors on food

safety practices.

Looking ahead, future research should focus on several key areas to enhance understanding and management of food safety in supply chains. Firstly, expanding the scope of case studies to include a wider variety of regions and food products will provide a more comprehensive view of the challenges and solutions applicable across different contexts. Investigating the effectiveness of emerging technologies, such as blockchain for traceability and advanced detection systems, could offer insights into innovative ways to address current limitations. Additionally, examining the role of cultural and economic factors in food safety practices can help tailor strategies to specific regional needs. Future studies should also assess the long-term impact of implemented strategies and regulatory changes on food safety outcomes. Collaborating with all stakeholders to develop and standardize best practices could further strengthen global food safety systems. Overall, approaches that integrates technology, regulation, and cultural considerations will be crucial for advancing food safety in the world.

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