

Embracing A Risk-Based Preventative Approach to Dairy Food Safety

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Abstract

Ensuring the safety of dairy products is a top priority for producers, regulators, and consumers alike. A risk-based preventative approach is a proactive strategy that focuses on identifying and mitigating potential hazards before they pose a threat to food safety. In this popular article, we will delve into the significance of adopting a risk-based preventative approach to dairy food safety. In the dairy industry, maintaining high standards of food safety is essential to protect consumers from potential health risks. A risk-based preventative approach offers a systematic method to assess, manage, and control hazards throughout the dairy production process. In the realm of food safety, particularly within the dairy industry, the adoption of a risk-based preventative approach stands as a pivotal strategy to ensure the quality and safety of dairy products.

Introduction

The dairy industry has evolved into one of the largest and most modernized food sectors in present-day commerce, which is characterized by large volumes of milk and a wide variety of dairy products in the food market. Partly, the dynamics of the dairy industry are influenced by an increase in the population, changes in food regulations, and consumer demands for safe and healthy milk product selection that is supplemented with a great variety and availability in the market. Although consumer trends are global, the nature and extent of their influence are shaped by geography, cultural norms, government policy, and socio-economic status. In most developing countries like Africa, the dairy industry is predominated by the informal sector, which is characterized by unregistered milk suppliers and processors who do not apply Food Safety Management System (FSMS).

As the industry is expanding and operating in a globalized environment, new challenges to food safety are continuing to emerge. Globalization of the food industry exposes populations worldwide to entirely new and unique food hazards. Regrettably, the dairy industry remains one of the most implicated food sectors associated with foodborne outbreaks, globally. Efforts have been made by the dairy industry to adopt different strategies for managing food safety. However, in most developing countries, the policies are more reactive rather than proactive. A reactive system is hazard-based, which uses the premise that the mere presence of a potentially harmful agent at a detectable level in food is justification for legislation and/or risk management action. However, it is also well known that the presence of a hazard does not necessarily mean that the product is harmful to human health.

Understanding the Essence of Risk in Dairy Food Safety

Risk assessment serves as the cornerstone of dairy food safety, enabling the identification of hazards that could compromise the integrity of dairy products. From microbial contaminants to chemical residues and physical hazards, a comprehensive understanding of risks empowers dairy producers to implement targeted preventive measures that safeguard product quality and consumer well-being.

Core Principles of a Risk-Based Preventative Approach

At the heart of a risk-based preventative approach lie key principles such as hazard analysis, risk assessment, and the implementation of control measures. By proactively addressing risks at critical points in the production chain, this approach aims to prevent foodborne illnesses and uphold the highest standards of food safety within the dairy industry.

In order to manage food safety amid an expanding dairy industry, any method to food safety reform must be proactive and risk-based. A risk-based food safety management methodology allows the consideration of exposure in assessing whether there may be unacceptable risks to human health. When considering a preventive approach to food safety management, all aspects of a food safety system, from farm -to -fork (raw material, distribution, food processing, retail, and consumer behaviour), are considered, ensuring that the combined efforts. A systematic evaluation of hazards and associated risks at each point in the supply chain is required. Undoubtedly, using a risk-based system, food safety management in the dairy industry would benefit by applying more effort toward managing the greatest risks, fully understanding the factors that contribute to the risk, allocating resources appropriately to prevent the risks and their root causes, and truly evaluating the effects of those efforts. Apart from benefiting the dairy industry alone, a risk-based approach to food safety is also used by regulatory bodies that monitor food safety. Government efforts are focused on the greatest risks and which have the greatest chances to lower the risk, wherever they may occur, through risk-based resource allocation. Concepts like qualitative and quantitative risk assessments, particularly Hazard Analysis and Critical Control Points (HACCP)-based FSMS, are essential to promoting a risk-based approach to food safety in the dairy industry.

Microbiological risk assessment and role in dairy food safety

Ensuring food safety for the consumers has been a major challenge. Globalization of the dairy industry has posed challenges in the industry to manage food safety. Food safety hazards such as microorganisms may enter at various stages along a dairy supply chain. Several intervention strategies have been implemented to prevent microbiological hazard presence in dairy products. These include GMP (good manufacturing practice) and HACCP principles, which are applied at specific stages of the production process, acting as preventive measures, and not the entire food production chain. Foodborne outbreaks from milk and dairy products are still reported regardless of FSMS programs in place. In the dairy sector, food safety management should be risk-

based and concentrated on the most relevant food safety hazards. Risk assessment provides a way of improving and managing food safety associated with pathogenic microorganisms as well as chemical hazards. Microbial risk assessment is a valuable tool used to organize and analyse scientific information to estimate the probability and severity of any adverse risk posed by a pathogen in a particular dairy commodity. Risk assessment can be defined as the measurement of risk and identification of factor that influences it. It is an independent scientific process that can be conducted qualitatively (offer qualitative data generated by descriptive data -such as high, medium, or low probability of contamination) or quantitatively (data, based on values on the prevalence and enumeration of pathogens and mathematical equations generated by predictive models).

The process includes four stages: (1) hazard identification, (2) exposure assessment, (3) hazard characterization, and (4) risk characterization as outlined by the Codex Alimentarius Commission (Codex, 1999). Risk assessment is a crucial tool for assessing the safety of new products, evaluating effective control measures to address food safety hazards, and setting priorities. Risk assessment is a crucial tool for assessing the safety of new products, evaluating effective control measures to address food safety hazards, and setting priorities. Risk assessments play a crucial role in the dairy industry by safeguarding consumers from food safety risks and facilitating international trade. Studies have quantified risks posed by pathogens in milk, particularly in developed regions like Europe and the United States, focusing on pathogens like *L. monocytogenes*, *Campylobacter jejuni*, *STEC O157*, and *Salmonella* spp. However, in developing countries such as those in Africa, few risk assessments have been conducted. For instance, some studies estimated the risk of haemolytic uremic syndrome (HUS) and brucellosis incidence in informally marketed milk in Africa. Factors like temperature and storage time significantly influence milk safety risks. Challenges in applying risk assessments in developing countries include diverse, data-scarce systems and limited resources. Microbiological hazards associated with raw milk products vary; soft and fresh cheeses

are linked to *L. monocytogenes*, *STEC*, *S. aureus*, *Salmonella*, and *Campylobacter* spp., while raw milk butter and cream are associated with *L. monocytogenes*, *STEC*, and *S. aureus*.

Hazard analysis critical control point based food safety systems

The establishment of a HACCP system in the dairy industry is the first step toward managing the safety of milk and dairy products. HACCP and its evolution to preventive controls have been hailed as promoting a risk-based approach to food safety. The application of HACCP programs on dairy farms have improved the quality and safety of milk intended for processing for those dairy farms that have adopted the system. On farm HACCP does not only cover milk safety but has components that improve the welfare of milk animals and environmental protection as demanded by consumers and retailers. HACCP on farms is linked to both operational management and food chain quality assurance. Dairy animals are one of the main reservoirs of pathogenic microorganisms, the presence of pathogens in milk is because of direct contact with the contamination sources which include the infected udder and fecal contamination. The HACCP system on farms applies cost-effective, accurate, and reproducible practices to monitor certain points which are contamination routes. However, this system is less effective for smallholder dairy farmers due to the high costs associated with testing methodologies. A joint guidance on Good Dairy Farming Practice was prepared and published by the international dairy federation and the Food and Agriculture Organization to improve the safety of milk at dairy farms. Good agricultural practices (GAP) are still applied at dairy farms; milking hygiene, animal feeding and water safety, animal welfare, and the environment. In dairy processing, the implementation of HACCP has been primarily reported as an effective approach to improve the safety of dairy products. For effective management of safety in the dairy industry at the processing level, good hygiene practices, a HACCP-based system, and other risk management metrics should be applied. An effective HACCP based program requires the expertise of scientists who understand the various types of hazards, the severity of illness or injury should those hazards be associated with the food and

the likelihood that the hazards would occur in those specific products. Dairy product manufacturers must understand and demonstrate their understanding of the various biological & other classes of hazards that could be introduced or were expected to be controlled at each step. Temperature treatment is crucial for ensuring the safety of dairy products, as they are vulnerable to microbial hazards. In the dairy industry, temperature-time combinations are considered a critical control point for most pathogens associated with dairy products. The process requires a critical multidisciplinary review of existing management processes, the establishment of limits via identification of critical control points, the use of routine surveillance procedures, effective record keeping, and documentation of standard processes.

The Advantages of a Risk-Based Approach

A risk-based approach to food safety in the dairy industry offers several benefits. It enhances consumer confidence, reduces costs, improves efficiency, and promotes greater transparency. By focusing on critical areas identified through risk analysis, companies can streamline their processes, leading to better overall efficiency. This collaborative approach encourages open communication within the supply chain, fostering continuous improvement and strengthening the overall food safety net.

In conclusion, the adoption of a risk-based preventative approach to dairy food safety represents a proactive and strategic endeavour to safeguard the integrity and quality of dairy products. By prioritizing risk assessment, preventive controls, transparency, and regulatory compliance, the dairy industry can navigate the complex landscape of food safety with resilience and dedication to consumer well-being.

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