





ORIGINAL ARTICLE

Safety of dairy products and its influence on health

Inocuidad de los productos lácteos y su influencia en la salud

Inocuidade dos produtos lácteos e sua influência na saúde

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ABSTRACT

Introduction: foodborne diseases are an international phenomenon that causes thousands of illnesses or deaths every year, including children and the elderly. Food safety is the process that guarantees food quality during the production process, storage and distribution. Avoiding effects in this process directly benefits the quality of life without representing a risk to health. **Objective:** to offer actions in the industrial process of the Milk and its Derivatives Plant Base Business Unit, belonging to the Productos Lácteos Guantánamo Company, that allows the safety of dairy products based on identified insufficiencies. **Method:** a qualitative and quantitative study was carried out in said plant in the period 2021-2022, where 43 workers (N=43) directly linked to the production process of dairy products participated. The questionnaire and participant observation were applied to obtain the information. In addition, the criteria and opinions of four directors and

six specialists of the entity were included. **Results:** limitations were found in the conception of alternatives that constitute novel actions for the application in the industrial process of quality results in the safety of dairy products based on the obsolescence of equipment and the levels of knowledge of Regular and Poor in 100% of the workers. Actions were applied to ensure safety. **Conclusions:** the actions presented satisfy the diagnosed limitations, corroborated during work performance to satisfy social demands for safety.

Keywords: safety; dairy products; foodborne diseases; industrial process; health; training



RESUMEN

Introducción: las enfermedades transmitidas por los alimentos es un fenómeno a nivel internacional que provoca cada año miles de enfermos o muertos, con la inclusión de niños y ancianos. La inocuidad de los alimentos es el proceso que garantiza la calidad de estos durante el proceso productivo, almacenamiento y distribución. Evitar afectaciones en este proceso beneficia directamente la calidad de vida sin que represente un riesgo para la salud. **Objetivo:** ofrecer acciones en el proceso industrial de la Unidad Empresarial de Base Planta de Leche y sus Derivados, perteneciente a la Empresa Productos Lácteos Guantánamo, que permitan la inocuidad de los productos lácteos a partir de insuficiencias identificadas. **Método:** se realizó un estudio cualitativo y cuantitativo en dicha planta en el periodo 2021-2022, donde participaron 43 obreros (N=43) directamente vinculados con el proceso productivo de los productos lácteos. Se aplicaron el cuestionario y la observación participante para la obtención de la información. Se contó, además, con los criterios y opiniones de cuatro directivos y seis especialistas de la entidad. **Resultados:** se hallaron limitaciones en la concepción de alternativas que constituyen acciones novedosas para la aplicación en el proceso industrial de resultados de calidad en la inocuidad de los productos lácteos a partir de la obsolescencia de los equipos y los niveles de conocimiento de Regular y Mal en el 100 % de los obreros. Se aplicaron acciones que permitan asegurar la inocuidad. **Conclusiones:** las acciones que se presentan satisfacen las limitaciones diagnosticadas, corroborada durante el desempeño laboral para satisfacer las demandas sociales de inocuidad.

Palabras clave: inocuidad; productos lácteos; enfermedades transmitidas por los alimentos; proceso industrial; salud; capacitación

RESUMO

Introdução: as doenças transmitidas por alimentos são um fenómeno internacional que causa milhares de doenças ou mortes todos os anos, incluindo crianças e idosos. A segurança alimentar é o processo que garante a qualidade dos alimentos durante o processo de produção, armazenamento e distribuição. Evitar efeitos nesse processo beneficia diretamente a qualidade de vida sem representar risco à saúde. **Objetivo:** oferecer ações no processo industrial da Unidade Empresarial de Base Planta de Leche y sus Derivados, pertencente à Empresa Produtos Lácteos Guantánamo, que permitam a segurança de produtos lácteos com base nas insuficiências identificadas. **Método:** foi realizado um estudo qualitativo e quantitativo na referida fábrica no período 2021-2022, onde participaram 43 trabalhadores (N=43) ligados diretamente ao processo produtivo de laticínios. O questionário e a observação participante foram aplicados para obtenção das informações. Além disso, foram incluídos os critérios e opiniões de quatro diretores e seis especialistas da entidade. **Resultados:** foram encontradas limitações na concepção de alternativas que constituam ações inéditas para a aplicação no processo industrial de resultados de qualidade na segurança de produtos lácteos com base na obsolescência dos equipamentos e nos níveis de conhecimento Regular e Ruim em 100% dos trabalhadores. Ações foram aplicadas para garantir a segurança. **Conclusões:** as ações apresentadas satisfazem as limitações diagnosticadas, corroboradas durante o desempenho do trabalho para satisfazer as demandas sociais de segurança.

Palavras-chave: segurança; produtos lácteos; doenças transmitidas por alimentos; processo industrial; saúde; treinamento

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INTRODUCTION

Food safety is of great importance in the preservation of health, prevention and care of people, by ensuring that once ingested food does not cause damage to the health of the population. Therefore, reducing the effects of physical, chemical and biological contaminants prevents thousands of people from falling ill or dying every year, including children and the elderly, caused by foodborne diseases (FBD), hence the World Health Organization (WHO) decided to declare June 7, 2019 as World Food Safety Day.

Dairy products are among the most consumed foods in the infant and older adult population, which due to their biological composition provide a high nutritional value of proteins, vitamins and minerals, especially calcium and vitamins B2 and B12, as well as essential fatty acids and some antioxidants, among other nutrients.^(1,2,3) Achieving their safety prevents the proliferation of bacteria capable of causing disease.

Dairy products are the source par excellence of calcium, an irreplaceable food in people's diets, especially for children, because calcium is involved in the formation of bones and teeth, in muscle contraction and in the transmission of impulses, it is a basic food in human nutrition at all stages of life.^(1,2,3) The industrial processing of these products allows extensive access to their consumption by the population, which contributes to a significant improvement in their level of health.

The benefits of dairy products are not limited exclusively to their nutritional value, but extend beyond that and constitute a preventive factor in certain conditions such as cardiovascular disease, some types of cancer, arterial hypertension or bone or dental diseases. It also contributes to the fight against childhood overweight and obesity.^(1,2,3)

From the benefits for human health exposed, dairy products need to be consumed with quality, therefore, to achieve innocuousness they need during reception, production, storage and distribution special conditions of cleaning and disinfection in the technological process, refrigeration and pasteurization, because these are perishable, fermented or of easy decomposition, hence their control, checking and inspection during production.^(4,5)

These products can be affected by factors such as contamination and growth of pathogens, chemical additives, environmental pollution and nutrient decomposition. Contaminants such as pathogenic microorganisms (*Salmonella*, *Escherichia coli*, *Listeria*, *Campylobacter*), toxins (mycotoxins that cause foodborne illnesses, often called "food poisoning") that can be especially dangerous for pregnant women and their unborn babies; as well as chemicals (pesticides, antibiotics, detergents, disinfectants) can lead to diarrhea, abdominal pain, fever, headache and vomiting.^(4,5,6,7,8)

In addition, physical factors such as foreign bodies that arrive accidentally, such as plastics, shells, bones, splinters, thorns, personal objects (pendants, earrings), among others, can cause discomfort or serious health problems such as choking or digestive problems. Therefore, maintaining the safety of these dairy products is important to prevent microbiological and physicochemical alterations.⁽⁴⁻⁸⁾



In the national and foreign sphere, there are several authors, as well as non-governmental organizations that address the need for the safety of dairy products,^(5-8,9,10,11,12) all agree in emphasizing that safety is the guarantee that food, once ingested, does not cause harm to human health and can perform its biological function.

In Cuba, in the post-pandemic stage and with the recrudescence of the economic situation, the production conditions and the results of the products up to that period changed drastically, which merited the search for ways from a scientific-methodological point of view to achieve quality.

The objective of this work is to offer methodological actions in the industrial process that provide, from a health perspective, the safety of dairy products based on the inadequacies identified in the workers. The starting point is to keep in mind that the production of safe food is framed among the priorities of the health system in order to maintain the quality of the products offered so that they do not cause damage to human health, mainly to the most sensitive sector of society, children, the sick, the elderly and the Maternal and Infant Program.

METHOD

A qualitative and quantitative study was carried out in the Basic Business Unit (UEB), Milk and its Derivatives Plant, belonging to the Guantánamo Dairy Products Company. For this purpose, the study universe was analyzed, constituted by 43 workers directly linked to the productive process of dairy products in a period of two years corresponding to 2021 and 2022. It was also useful to have the criteria and opinions of four managers and six specialists of the entity.

Theoretical and empirical methods were used: analytical-synthetic, inductive-deductive, which made it possible to analyze, synthesize and organize the research and theoretical formulations collected from the specialized bibliography and literature in general. The inductive-deductive method made it possible to study the information gathered for the elaboration of actions and the determination of the main regularities derived from the research.

As empirical methods, the following were applied: questionnaire and participant observation to obtain truthful information on an individual basis, necessary to determine the current state of the level of knowledge and professional skills in the technological process that guarantees the safety of dairy products. For the analysis, the opinion of the specialists and management on the research topic was taken into account, as well as the way the workers act in the technological process.

The workers observed the performance that guarantees the safety of dairy products in the production scenario, as well as the post-pandemic indicators.

A bibliographic review was carried out on the subject under study. The databases CUMED, EBSCO, LILACS, SciELO, and the Virtual Health Library of Cuba (BVS), International Dynamic Advisors (Intedya) were used, which allowed knowing the antecedents and actuality of this problem at international and national level.



Descriptive statistics were used to organize and classify the data obtained in the measurement. The results were presented in frequency distribution tables.

RESULTS

The research specifies the need to establish the dependent variable "level of preparation of workers to ensure the safety of dairy products", defined by the author as: the level reached in the theoretical, practical and ethical knowledge of the workers, to ensure the safety of dairy products.

Based on the definition, the dimensions and indicators were expressed and measured in all cases, using an ordinal scale that expressed the degree to which they are manifested. For qualitative analysis, a scale of three categories was used: Good (B), Fair (R) and Bad (M), which were assigned values of 3, 2 and 1, respectively. B was weighted if all the indicators were evaluated as B or if there were four B and one evaluated as R. R was estimated when all the indicators were evaluated as R or if there were four R and one B or if there were three B, one R and one M; on the other hand, M was considered if all the indicators were evaluated as M or if there were two R and three M.

Three dimensions were determined:

The first dimension: Level reached in theoretical knowledge, it was revealed when the workers showed the acquisition of knowledge that allowed them to integrate the theoretical aspects to ensure the safety of dairy products.

The second dimension: Development of the practice to guarantee the safety of dairy products, it was verified when the workers showed mastery in the systematized realization of the steps in the technological process.

The third dimension: Referred to the ethical-technical level, it was specified when the ethical level reached by the worker allowed him/her an adequate capacity to create a favorable productive environment that guarantees the quality and innocuousness of the productions as a guarantee of consumer health.

The research focused on offering the result referred to dimension one: level reached in theoretical knowledge, which exposed the following indicators.

As can be seen, the behavior of dimension one: Level reached in theoretical knowledge of dairy product safety, in the census population composed of 43 workers, was as follows: 31 were evaluated as Poor (72.1%), 12 as Fair (27.9%) and none was evaluated as Good,



All the indicators showed poor performance, except for the indicator Comprehensive knowledge of compliance with good manufacturing practices in production to ensure safety, for which training actions are proposed in the technological process to ensure the safety of dairy products in the post-pandemic period (Table 1).

Table 1 Level achieved in theoretical knowledge on dairy product safety according to indicators

Indicators	Evaluation					
	Good		Fair		Bad	
	No.	%	No.	%	No.	%
Knowledge of the concept of food safety.	-	-	1	2,3	42	97,7
Knowledge of Decree-Law No. 9 "Food Safety".	-	-	18	41,9	25	58,1
Comprehensive knowledge of compliance with good manufacturing practices in production to ensure food safety.	-	-	34	79,1	9	20,9
Quality and safety, in terms of raw materials, process and finished product.	-	-	11	25,6	32	74,4
Knowledge to describe flow charts and identify critical control points.	-	-	2	4,7	41	95,3
Dimension	-	-	12	27,9	31	72,1

Source: Questionnaire to workers

DISCUSSION

There is currently poor knowledge related to the measures to be considered for safety, seen in the handling, packaging and transport of dairy products and, therefore, it is essential from the study that was conducted to improve the skills and the work scenario where the production process is carried out.

The identification of these insufficiencies allowed the projection in the training of a system of scientific-methodological actions to ensure the safety of dairy products during the technological process and to give answers to the social demands referred to promote quality of life in post-pandemic times where there is a limitation of resources, materials, raw materials and service goods, caused by adverse economic situations due to the restrictions generated by the pandemic, as well as others that hinder and prevent the arrival of new equipment.

For this research it is of incalculable value the conceptions of Advanced Education, that is why the professional improvement is assumed, as expressed by Añorga⁽¹³⁾ as: (...) the positive transformations in the intellectual, physical and spiritual development of man from knowing, internalizing and becoming aware of his cognitive and affective problems, his skills and aspirations, with sufficient rationality and motivation for the profession and for life, according to a given social context, evidenced in the performance, with a creative intention, to contribute with their competencies and their intellectual production and/or material goods, to the behavior and functioning of their work-professional, family and community environment, through their personal, professional, ecological, socioeconomic satisfaction and their own human virtues".



This paradigm makes it possible to organize, plan, execute and evaluate the improvement in the work performance of human resources by combining the knowledge acquired with the social commitment of this worker. It should be noted then that the treatment of the safety content of dairy products is manifested in the actions that support the training of this worker for the benefit of work performance, with adequate theoretical and practical knowledge of their work, in which it is required to act with speciality and creativity coupled with values, feelings, virtues, sensitivity and social commitment to apply them to prevent disease.^(14,15,16)

The postulates of this theory arise from the objectives and general laws of Didactics, which are revealed in the dialectic relationship between the didactic categories, being the content in this case the one that propitiates from its internal structure to provide the knowledge, skills and values that make up the necessary capabilities for this worker to achieve with quality in the industrial process the safety of dairy products.

Food safety is a term that alludes to the preventive measures and characteristics that define a food as safe for consumption and with quality that does not cause harm to health.^(9,17,18,19)

Consequently, the authors define that the safety of dairy products is the productive process to achieve a finished product with organoleptic and sensory characteristics (appearance, smell, taste and texture), physical-chemical (properties) and microbiological (pathogenic microorganisms), which complies with the standard parameters, in which a high level of cleaning and disinfection must be achieved, as well as quality in the solutions used for this purpose to maintain in the technological equipment during the closed circuit washing certain parameters to be controlled such as: flow, concentration, time and temperature of the solution used.

Therefore, the disinfection of floors, walls, ceilings and the environment surrounding the premises where the food processing is located, without excluding the food handlers, is also taken into account. It is the continuous check from the start of production to ensure quality in terms of raw materials, processes and finished products, stored and including drinking water, as well as during distribution, is crucial critical control points to prevent contamination, is sustainability in food quality and technological flow control, maintaining the cold chain, is to provide the customer with a healthy product that does not harm the health of human beings.

These arguments that are exposed provide the worker with the contents that allow him to value that his efforts make possible the prevention of negative impacts on health, psychological and economic consequences of diseases, in the families of the sick, which achieve the determination of the perception of risk and human sensitivity. In addition to the technological process to determine whether the finished product meets the requirements of quality and safety, and if the production process was under control, so they can take appropriate corrective measures before distribution to the population.



In the elaboration of the actions, the description of the flow diagrams of each of the processes was taken into account in order to determine the critical control points(20) , seen as stages in the industrial technological process in which control measures are applied to prevent or reduce a significant danger in the process and the safety of dairy products:

- Critical control points.
- Continuous and discontinuous pasteurizers: control pasteurization temperature and eliminate pathogenic microorganisms.
- Refrigerator block: Maintain temperature below 10 °C to inhibit the development of microorganisms.
- Control and storage of raw materials: the quality of the finished product depends on a good selection of raw materials.
- Man as the protagonist of the technological process.

All personnel involved in production are expected to carry out self-preparation as a valuable training tool that makes it possible to guarantee quality care for the population.

- Self-preparation to know the definition of food safety approached by different organizations, and thus during production keeps in mind the perception of risk and ensures the safety of dairy products.
- The flow charts should be updated to take into account the changes and advances in technology, to know in detail all the stages of the production process, and thus identify the critical control points, which are the areas or equipment where the fundamental parameters of flow, temperature, pressure, which guarantees the safety of dairy products are worked and controlled, considering that the vast majority of the assortments produced are in bulk.
- Compliance with good manufacturing practices in production that safeguard safety, in the technological flow tanks, valves, pipes, accessories, tank tanks (pipes), hoses, buckets and auxiliary tanks, as well as utensils for bulk dispatch, hands and boots of the personnel involved in the production in order to check the efficiency and quality of the cleaning and disinfection process, as well as the hygiene of the personnel and thus avoid obtaining productions that affect the customer and cause food-borne diseases (FBD) in the short, medium and long term.
- Prepare the cleaning solutions to be used with the established compositions: four fundamental aspects should be taken into account: concentration of the solution, which prevents poor hygiene and disinfection of the technological process; flow so that it is in turbulent regime and can drag the dirt; time because it is important and vital for the recirculation of the cleaning materials in a closed circuit in the established space and temperature, which acts as a catalyst in accelerating the solubility and softening of the residues of existing products in the technological equipment.
- Sterilization should be performed with steam; the gas expands to all areas of the equipment to be sterilized and not water at 90 °C.



- Review the quality of the raw materials, order of addition, the elaboration process and storage conditions in the refrigerator of the finished products, that are not on the floor, covered and separated for better recirculation of cold air, thus helping its conservation, since it is recognized its particular characteristics of being perishable, fermented, of very easy decomposition, which avoids changes in the organoleptic characteristics.

It is of great value to highlight the role played by the evaluation in raising the awareness of the participants about the positive and negative aspects faced during the whole process of implementing the actions. All these actions have a social, economic and environmental impact that benefits human health.

Providing workers with knowledge does not negate the implementation of new technologies, but makes it possible to offer a timely quality of products, since a harmless finished product that does not affect the health of the population is achieved, epidemiological outbreaks are avoided, a sense of belonging, sensitivity towards sensitive sectors of society, all this with an impact from the environmental and economic point of view.

Regarding the environment, cleaner productions are obtained, when strategies are designed so that cleaning solutions are not discharged into the environment, taking into account that aggressive acids such as sulfuric and phosphoric acids are used, in addition to sodium hydroxide (caustic soda), which must be recovered in the tanks of the cleaning station to then be standardized and used again without being added to the environment and thus not affecting the flora, fauna and ecosystems, which is also beneficial to human health.

Regarding the economic aspect, which also promotes quality of life by using it as an aspect of sustainability that provides that quality, since mechanisms are used to recover the cleaning and disinfection materials to achieve savings, since the raw material to produce it is very expensive in the international market, in addition to avoiding non-compliant production, as well as penalties for deviations in quality and safety by ensuring that the finished product is safe, compliant and does not cause harm to human health.

CONCLUSIONS

The results obtained serve to characterize the problems related to the safety of dairy products in their benefit to the quality of life and provide information for the planning of actions that lead to the application of measures that provide quality in industrial production. The level of preparation of the workers was evaluated as fair and poor in the majority.

A system of actions is provided that facilitates self-preparation from the workplace in current specific conditions for the achievement of the safety of dairy products in compliance with the social requirement of disease prevention and health protection.



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