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Development and Implementation of the HACCP System on the Production Line of Kefir from Goat's Milk

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Abstract: The purpose of this work is to develop a HACCP plan with the subsequent implementation of the HACCP system to ensure the safety of production of kefir from goat's milk produced in the "Breeding farm" Zerenda "LLP in the Akmola region. When implementing HACCP defined policy and security of products, the scope of the HACCP system, the appointment of working group HACCP, identified hazards, identified Critical Control Points (CCP) for certain operations of the process and developed the cautionary measures to eliminate risks or reduce them to an acceptable level and the proposed corrective actions. Stages of hazard analysis are the basis of the HACCP system. The first stage of this analysis is to identify threats to human health and assess the identified hazard. Hazards are usually divided into three categories: Biological, chemical and physical. The second stage is the selection of critical control points. To select critical control points on the line for the production of kefir from goat's milk produced in LLP" Breeding farm "Zerenda" of Akmola region, the method of "Decision Tree" was used, which allows to determine critical control points at the stage of the technological process. The implementation of "Decision Tree" method proves that the stages of raw milk storage, pasteurization and fermentation, are critical control points in relation to the identified preliminary threats to the safety of the dairy product - kefir from goat's milk produced in "Breeding farm" Zerenda "LLP.

Keywords: Kefir From Goat's Milk, Quality, Safety, HACCP, Indicators, Dangerous Factors, Critical Control Points, Process Analysis

Introduction

In the last 10 years, the number of cows in Kazakhstan has been decreasing, while the productivity of the herd is not growing fast enough, so as a result, the gross milk production in the country is reduced. Milk production is decreasing, while consumption of dairy products, on the contrary, is increasing. One of the ways to solve the problem is to introduce milk from other animals, including goats, into the dairy industry. One of the most popular processed products from goat's milk is goat kefir. Kefir from goat's milk is a balanced product that has a high health value and has easy digestibility due to the fact that its fat balls and casein micelles are 10 times smaller than cow's milk, thus they are more easily absorbed by the intestinal walls and easily absorbed by the stomach. The presence of bifidobacteria in yogurt allows us to classify it as a so-called "live" food.

Kefir is a fermented milk product with a high content of dry skimmed milk substances, made using a mixture of fermenting microorganisms of thermophilic lactic acid streptococci and Bulgarian Bacillus, while the total content of fermenting microorganisms in the finished product at the end of the shelf life is at least 10^7 CFU per 1 g of the product.

High-quality kefir made from goat's milk is not easy to buy today. Only a product that contains live lactic acid bacteria – bifid bacteria - is useful for health. Their life span does not exceed 4-5 days. On the shelves of stores are mostly found kefir with a two-week or even a month shelf life. Naturally, this product does not

contain any living bacteria. In this regard, we have developed kefir from goat's milk.

Currently, many countries recognize the problem of quality and safety of food products as one of their priority areas of activity. Cases of outbreaks of diseases associated with the consumption of low-quality food products indicate the need for a radical change in approaches to product quality in order to ensure food safety, reduce the risks of infection with diseases associated with the consumption of such products (Klementieva and Lanceva, 2017; Kantere *et al*., 2008).

Today, it is impossible to supply goods to the world market without knowledge of international standards. The principles of Hazard Analysis and Critical Control Points (HACCP), which are synonymous with safety for consumers in many countries, are widely recognized around the world (Vasileva, 2013; Baryshnikova *et al*., 2017; Bondareva, 2010).

In order to ensure that food safety meets the requirements of TR CU 021/2011, each company is required to develop, implement and maintain procedures based on the principles of HACCP in the implementation of food production (manufacturing) processes (Smirnova *et al*., 2015; Zamyamina, 2006).

HACCP is an integrated food safety control system, the implementation of which gives consumers confidence in the safety of production, allows them to strictly comply with the requirements of legislation in the field of food safety and demonstrate effective management of food safety in documents-evidence that can be used in the event of a lawsuit (Antonov and Shiryaev, 2015; Grevtsova *et al*., 2016).

The introduction of the HACCP system means that the company's management shifts its focus from General inspection of already manufactured products to conducting preventive control of possible hazards that may occur at any stage of the production cycle. In addition, HACCP contains practical recommendations on the means and methods of quality control (Tolstova, 2013; Mortimore, 2014; Aptrakhimov and Rebezov, 2014).

Advantages of implementing the HACCP system:

- Increasing consumer confidence in products, which in turn affects the company's sales and profits
- The HACCP system allows the manufacturer to specify documents and records confirming that food production is under control. This increases the level of customer and consumer confidence in the product itself
- New market access opportunities. There is growing market demand for safe products. Many wholesale buyers and retail chains require confirmation of food safety not only by certificates of safety of the product itself, but also by certificates of safe production. The existing HACCP system provides opportunities and offers (Yussupova *et al*., 2019; Prokoshenkova and Lantseva, 2019)

The purpose of this work is to develop a HACCP plan with the subsequent implementation of the HACCP system to ensure the safety of production of kefir from goat's milk produced in the "Breeding farm "Zerenda "LLP in the Akmola region.

Materials and Methods

The subject of research is the process of production of dairy products- kefir from goat's milk produced in the "Breeding farm "Zerenda "LLP of Akmola region. The development of the HACCP plan was carried out according to the standard of ST RK ISO 22000-2006" Food safety management systems – requirements for any organization in the food chain" and ST RK 1179-2003" Quality systems. HACCP principles for food products quality management. General requirements". When implementing the HACCP system, the following sequence of actions was carried out: Creating a policy; determining the safety area of products and the distribution area of the HACCP system at the enterprise; appointing a working group for the development and implementation of HACCP; determining hazards; identifying critical control points and their permissible limits; developing documentation for preventive and corrective actions.

Results and Discussion

The first priority when applying HACCP at a milk processing plant was to create a team with the knowledge and experience to develop an HACCP plan. The formed team was multidisciplinary and included employees of the company from the Department of production, sanitation and quality assurance, in accordance with the requirements of the Standard (ST RK ISO 22000-2006; ST RK 1179-2003) personal responsibility for the safety of dairy products – kefir from goat's milk, is assigned to the head of the company. The object of research is the area of distribution of the HACCP system – a technological line for the production of kefir from goat's milk, including the following stages: Acceptance of raw milk, acceptance of fungal leaven, purification of raw milk, cooling and storage of raw milk, separation, normalization, purification, homogenization, pasteurization, cooling, fermentation of products, fermentation, mixing and cooling, maturation, bottling, packaging, labeling. A block diagram of the process of producing kefir from goat's milk is shown in Fig. 1. The source data for conducting threat analysis and developing an HACCP plan is the product description in the organization's standard (Table 1) the list of raw materials and ingredients used is given in Table 2.

Sourdough on kefir fungi is produced in accordance with the requirements of the "Technological instructions for the preparation and use of starter cultures and bacterial concentrates for fermented milk products in the dairy industry".

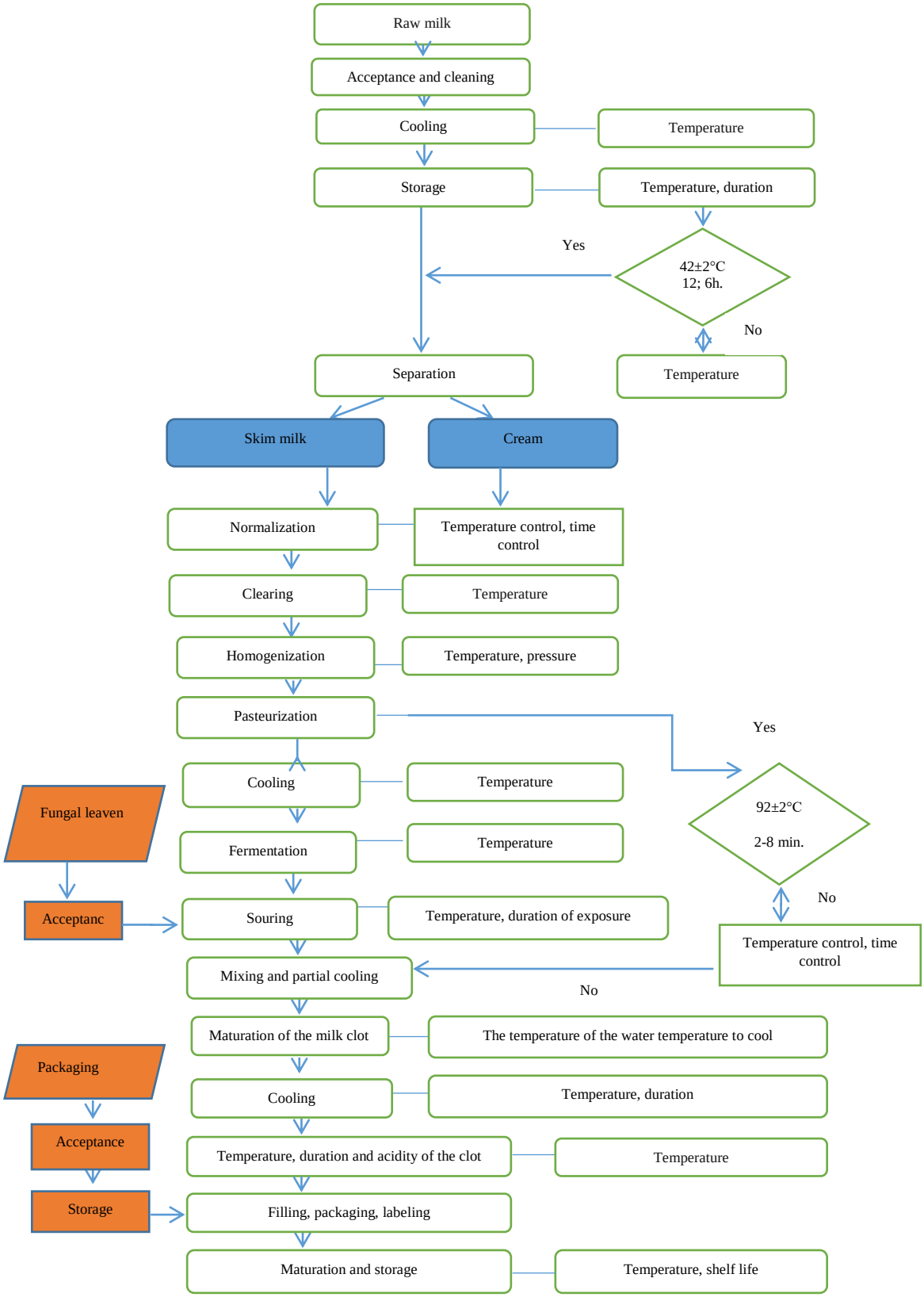

Fig. 1: Block diagram of production of products - kefir from goat's milk

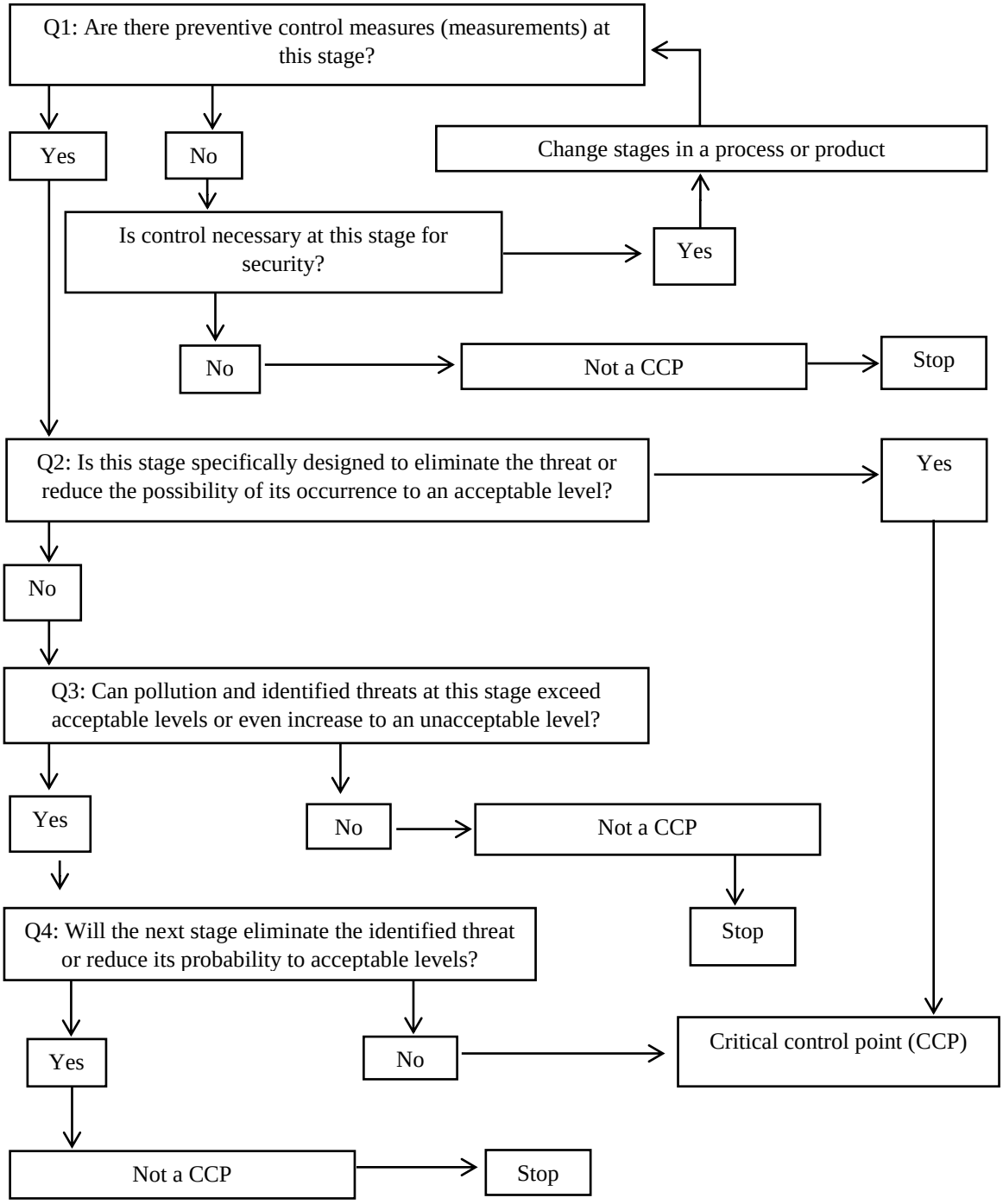

Fig. 2: Determination of critical control points for the "Decision Tree" on the production line of kefir from goat's milk

Further, after determining the product requirements, we analyzed various types of hazards, the possibility of changing the stages of the technological process, the operation of equipment and the threat of new risks. This stage allows you to identify all potential risks at different stages of the product life cycle. Risk analysis is carried out in two stages: Risk identification and risk assessment. At these stages, it is necessary to consider all possible types of potentially dangerous factors: Microbiological, chemical and physical, which can affect the safety of the finished product during the technological process.

After the risks and appropriate procedures for their control were identified in the production of products – kefir from goat's milk, we were assigned and completed the task of assessing each risk in terms of the severity of consequences and the likelihood of its implementation.

Table 1: Description of the product – kefir from goat's milk

Product	Kefir from goat's milk standard of organization 140540024607-03-2018
Product characteristics that are important for its safety	Acidity -85 to 130 t^0; clean taste and smell, sour-milk, salty taste, without foreign tastes and odors; consistency is homogeneous, gas formation is allowed; weight fat percentage of 2.5%.
How it will be used	Ready for use
Prospective consumers	All population groups, including children, the elderly and the sick
Packaging	Containers made of polymer material with a capacity of 0,5 l to 1 l
Shelf life	10 days at a temperature of 4±2°C
Place of implementation	Retail stores, preschool and school institutions, medical and Spa institutions
Instructions on the label	Store at a temperature of 4±2°C until (specific shelf life)
Terms of delivery	Refrigerated by special means of transport

Table 2: List of raw materials and ingredients used for the production of products-kefir from goat's milk

Indicator	Components
Dairy ingredients	Raw goat milk according to GOST 32940-2014 The yeast in kefir fungi
Other ingredient	-
Shipping materials	Containers made of polymer material with a capacity of 05, l to 1 l in accordance with HS 2.3.3.97-00

Table 3: Identification of hazards and preventive actions on the production line of kefir from goat's milk

Ingredients, process steps	Potential danger	Description Raw materials and components	Is danger possible?	Preventive measures
Raw milk	Biological: pathogenic microorganisms, including Salmonella, *L. monocytogenes*, *B. cereus* and *S. aureus*	The presence of pathogenic microorganisms in the finished product can cause severe intestinal diseases	Yes Raw milk can be a source of pathogenic microorganisms	Control of accompanying documentation, control of milk at acceptance, program of preliminary actions (PPA) in relation to suppliers
	Chemical: - toxic element; - mycotoxins; - antibiotics, inhibitory substances; - pesticides; - radionuclides; - residues of detergents and disinfectants	The presence of these substances in quantities that exceed acceptable levels can lead to poisoning of consumers	Yes As a result, inappropriate farming practices	Enhanced control on the farm, control over the purity of containers. Choice of suppliers. Control of milk during the acceptance of the program of preliminary activities in respect of the supply of raw materials
	Physical: extraneous, solid inclusions	The presence of stones, metal inclusions, wood particles, glass, etc. in the product can seriously injure consumers	Yes As a result of inappropriate farming practices, milk may contain foreign solids	Acceptance control, filter cleaning control, PPA control of the laboratory.
Fungal leaven	Biological, chemical, physical	The presence of stones, metal inclusions, wood particles, glass, etc. in the product can seriously injure consumers		It is controlled by the program of preliminary measures in relation to the selection of suppliers, control of accompanying documentation.
Shipping materials	Biological, chemical, physical	The presence of stones, metal inclusions, wood particles, glass, etc. in the product can seriously injure consumers		It is controlled by the program of preliminary measures in relation to the selection of suppliers, control of accompanying documentation.
The stages of the process				
Acceptance of raw milk	Biological: - pathogenic microorganisms, including Salmonella, *L. monocytogenes*, *B. cereus*, *S. Aureus* - bacteria of Group of Intestinal Sticks (BGIS)	The presence of pathogenic microorganisms in the finished product can cause severe intestinal diseases	Yes Contamination with pathogenic microflora from equipment and personnel	It is controlled by the PPA in relation to training and hygiene of personnel, sanitary treatment of equipment and premises
	Chemical: - residues of detergents and disinfectants, lubricants	The presence of these substances in quantities that exceed acceptable levels can lead to poisoning of consumers	Yes If you do not follow the rules and modes of washing and disinfection	It is controlled by the PPA with regard to training and hygiene of personnel, sanitary treatment of equipment and premises and rules for storing special substances
	Physical: - foreign, solid particles	The presence of stones, metal inclusions, wood particles, glass, etc. in the product can seriously injure consumers	Yes The ingress of dust or other solid objects during sampling for analysis from personnel, from the ceiling with open tank covers	PPA is monitored in relation to personnel training and hygiene and the sanitary condition of equipment buildings. Milk purity control, milk purification
Acceptance of the fungal leaven	Biological, chemical, physical	The stage does not bring any danger and the PPA functions effectively in relation to these stages		
Acceptance of packaging materials	Biological, chemical, physical	The stage does not bring any danger and the PPA functions effectively in relation to these stages		
Purification of raw milk	Biological, chemical, physical	The stage does not bring any danger and the PPA functions effectively in relation to these stages		

Table 3: Continue

Cooling and storage of raw milk at a temperature of 4±2°C	Biological: - pathogenic microorganisms, including Salmonella, *L. monocytogenes*, *B. cereus*, *S. Aureus* - BGIS	The presence of pathogenic microorganisms in the finished product can cause severe intestinal diseases	Yes When storing raw milk in an uncooled state, pathogenic microflora may grow to an unacceptable level; contamination from equipment, air and external sources may occur	Control point. Control of temperature and shelf life. MRP in relation to the treatment of equipment, premises
	Chemical: - enterotoxins; - residues of detergents and disinfectants, lubricants	Enterotoxins in the finished product can lead to severe intestinal diseases, up to a fatal outcome. Detergent residues can cause allergies or lead to poisoning of consumers	Yes	Control point. Control of temperature and shelf life. PPA in relation to the treatment of equipment, premises
	Physical	The stage does not bring any danger and the PPA functions effectively in relation to these stages		
Separation	Biological, chemical, physical	The stage does not bring any danger and the PPA functions effectively in relation to these stages		
Normalization	Biological, chemical, physical	The stage does not bring physical danger in the presence of PPA		
Clearing	Biological, chemical, physical	The stage does not bring physical danger in the presence of PPA		
Homogenization	Biological, chemical, physical	The stage does not bring physical danger in the presence of PPA		
Pasteurization	Biological: - pathogenic microorganisms, including Salmonella, *L. monocytogenes*, *B. cereus*, *S. Aureus* - BGIS	The development of pathogenic microorganisms in the finished product can lead to severe intestinal diseases	Yes The pathogenic microflora that survived as a result of the violation of the regime can manifest itself at the stage of fermentation and in the finished product	Control point. Compliance with PPA pasteurization regimes with regard to equipment serviceability.
	Chemical: - residues of detergents and disinfectants	Poisoning of consumers	Yes If the washing and disinfection modes are not observed	PPA in relation to washing and sanitizing equipment.
	Physical	The stage does not bring physical danger in the presence of PPA		
Cooling	Biological: - pathogenic microorganisms, including Salmonella, *L. monocytogenes*, *B. cereus*, *S. Aureus* - BGIS	The development of pathogenic microorganisms in the finished product can lead to severe intestinal diseases	Yes Secondary contamination from non-pasteurized milk through small cracks	Monitoring and ensuring the pressure of pasteurized milk
	Chemical: - residues of detergents and disinfectants	Poisoning of consumers	Yes If the washing and disinfection modes are not observed	PPA for cleaning and sanitizing equipment.
	Physical	The stage does not bring physical danger in the presence of PPA		
Fermentation	Biological: - pathogenic microorganisms, including Salmonella, *L. monocytogenes*, *B. cereus*, *S. Aureus* - BGIS	The development of pathogenic microorganisms in the finished product can lead to severe intestinal diseases	Yes When applying the starter, contamination from personnel, the environment and equipment is possible	PPA for cleaning and sanitizing equipment and premises
	Chemical: - residues of detergents and disinfectants	Poisoning of consumers	Yes If you do not follow the rules and modes of washing and disinfection	PPA for washing and sanitizing equipment
	Physical Foreign solid particles, fibers, etc.	The presence of stones, metal inclusions, wood particles, glass, etc. in the product can seriously injure consumers.	Yes When making leaven from the staff, the environment	PPA for cleaning and sanitizing equipment and premises
Souring	Biological: - pathogenic microorganisms, including Salmonella, *L. monocytogenes*, *B. cereus*, *S. Aureus* - BGIS	The presence of pathogenic microorganisms in the finished product can lead to severe intestinal diseases	Yes Possible development of pathogenic microflora as a result of non-compliance with souring regimes	Control point. Maintaining the fermentation temperature no more than 22°C until pH 4.65-4.5 is reached. PPA for washing and sanitizing equipment
	Chemical	Enterotoxins in the finished product can lead to severe intestinal disease up to death.	As a result of non-compliance with souring regimes, the product may develop pathogenic microflora and accumulate enterotoxins that do not break down during heat treatment	Control point. Maintaining the fermentation temperature no more than 22°C until pH 4.65-4.5 is reached. PPA for washing and sanitizing equipment
	Physical	The stage does not bring physical danger in the presence of PPA		
Mixing and partial cooling	Biological, chemical, physical	The stage does not bring physical danger in the presence of PPA		
Maturation of the milk clot	Biological, chemical, physical	The stage does not bring physical danger in the presence of PPA		
Cooling	Biological, chemical, physical	The stage does not bring physical danger in the presence of PPA		
Pouring	Biological: - moulds	Mould can lead to product damage and poisoning	Yes Mould contamination from equipment, environment and packaging	PPA in relation to the maintenance of equipment and premises, selection of suppliers of packaging materials, packaging control
	Chemical - residue of detergents and disinfectants	Poisoning of consumers	Yes If you do not follow the rules and modes of washing and disinfection	PPA for washing and sanitizing equipment
	Physical	The stage does not bring physical danger in the presence of PPA		

Table 3: Continue

Packing	Biological: - moulds	Pathogenic microorganisms in the finished product can hardly develop, but mould can lead to product damage and poisoning	Yes Possible contamination from personnel, equipment, environment and packaging materials	PPA in relation to staff hygiene, repair and maintenance of training and premises, selection of suppliers of packaging materials, packaging control
	Chemical: - residue of detergents and disinfectants	Poisoning of consumers	Yes If you do not follow the rules and modes of washing and disinfection	PPA for washing and sanitizing equipment
	Physical - foreign solid particles, fibers, etc.	The presence of stones, metal inclusions, wood particles, glass, etc. in the product can seriously injure consumers	It is possible to get foreign objects from the staff, from the surrounding environment	PPA in relation to staff hygiene, repair and maintenance of training and premises
Marking	Biological and chemical: - products of microbiological and chemical spoilage of the product	The presence of microbiological and chemical spoilage in products can lead to severe poisoning	If the production date is incorrectly applied to the label, the product may be available for consumption after the expiration date	Control of the correct marking, including expiration dates and production dates
	Physical:	The stage does not bring physical danger in the presence of PPA		
Storage	Biological: - moulds	Mould can produce toxins that cause severe poisoning up to death. Thus, mould is a source of chemical hazards	Yes If you do not comply with the storage regime and terms, mould may develop in the product	Control point. Control of temperature and shelf life within the production program of preliminary measures
	Chemical: - toxins produced by moulds; - products of oxidation and decomposition of fat and protein	Toxins produced by mould, products of oxidation and decomposition of fat and protein can lead to severe poisoning of consumers	Yes If you do not follow the storage regime and terms, you may develop mould in the product and oxidation and decomposition of fat and protein	Control point. Control of temperature and shelf life within the production program of preliminary measures
	Physical:	The stage does not bring physical danger in the presence of PPA		

Table 4: Critical control points on the production line of kefir from goat's milk

		Determination of critical control points				
Stage name	Identified dangerous factor	Question 1	Question 2	Question 3	Question 4	CCP or warning measures
Acceptance of raw milk	Biological	Yes	-	Yes	Yes	Potential CCP Control of milk during
	Chemical	Yes	-	Yes	No	acceptance for the content of inhibitors. PPA in acceptance
Cleaning and cooling of raw milk	Physical	Yes, monitoring and changing filters	Yes	-	-	Potential CCP managed under the PPA
Storage of raw milk	Biological	Yes	No	Yes	Yes	CCP1 Pasteurization, temperature control and storage duration
	Chemical	Yes	No	Yes	No	Potential CCP managed under the PPA
Pasteurization	Biological	Yes	Yes	-	-	CCP 2
Cooling	Chemical	Yes	No	Yes	No	Potential CCP managed under the PPA
	Biological	Yes	No	Yes	No	Potential CCP managed under the PPA
Fermentation	Biological	Yes	Yes	-	-	
	Chemical	Yes	Yes	-	-	
Souring	Biological	Yes	Yes	-	-	CCP 3
Filling and packaging	Biological Chemical					Potential CCP managed under the PPA
Storage of the finished product	Biological	Yes	No	Yes	No	Potential CCP managed under the PPA
	Chemical	Yes	No	Yes	No	

The results of the analysis showed that the sanitary condition of the enterprise is satisfactory, the raw material used for the production of kefir from goat's milk is subject to multiple controls, meets the requirements of standards and, therefore, does not pose a threat to human life and health. During the work of the enterprise of dairy products "Breeding farm "Zerenda" LLP, there were no complaints from consumers, the competent authorities did not register any cases of production of substandard products.

For a more detailed analysis of all possible threats to the production of substandard products, we turned to the statistical data of the enterprise "Breeding farm "Zerenda "LLP, as well as to the documents regulating the quality and safety of the product.

The identified potential hazards and precautionary measures on the production line - kefir from goat's milk are presented in Table 3.

Further, "Decision tree" method was used to determine critical control points, which allowed for a systematic approach to determining the CCP and can also serve as the main one for developing a documented procedure for selecting the CCP (Fig. 2).

The figure shows that critical points or stages are intended to reduce or eliminate a potentially dangerous factor, as well as stages at which the identified threat may exceed acceptable levels. However, subsequent steps do not eliminate or reduce this dangerous factor to an acceptable level. Determination of the critical control

points identified during the analysis, we conducted the entire production line of kefir from goat's milk and for each potentially dangerous factor separately.

The definition of critical control points for the technological line for the production of kefir from goat's milk is presented in Table 4.

For the final decision on the degree of criticality of a particular stage of the technological process, we took into account the program of preliminary measures. The implementation of the "Decision Tree" method for the stages of raw milk storage, pasteurization and fermentation leads to the conclusion that these stages are critical control points in relation to the identified preliminary threats to the safety of the dairy product – kefir from goat's milk.

Thus, we have experimentally found that the critical control points for this production process are at the stages: Storage of raw milk, pasteurization, fermentation. All other potential control points are managed within the framework of the preliminary activities program (Table 4).

When creating a safety management system for the production of any fermented milk products, including kefir from goat's milk, special attention should be paid to ensuring the safety and quality of the starter cultures used, since the fermentation process often takes place in conditions favorable for the development of undesirable microflora or close to them.

The final stage was the development of the HACCP plan, which reflects preventive measures that eliminate risks or reduce them to an acceptable level and suggests corrective actions (Table 5).

Table 5: The HACCP plan

CCP	Dangerous factor	Critical limit	Monitoring procedure	Corrective action	Verification procedure	HACCP record
CCP 1. Storage of raw milk	Accumulation of enterotoxins as a result of the development of pathogenic microflora in case of non-compliance with the temperature regime and duration of storage	Temperature not higher than 6°C; duration-no more than 6 h; temperature-no more than4°C; duration – no more than 12 h	Control of milk temperature and duration of storage of raw milk - a master, every 3 h	Checking the operation of the cooling system and adjusting the temperature. Informing the Manager to make a decision about the future use of milk. If necessary, according to the test results, non-conforming products are rejected. Identification of the reasons for the deviation and their elimination. Conducting additional training for employees	Periodic verification and confirmation of MS accuracy (once a decade) sampling of milk from storage tanks testing for microbiological indicators. Confirmation of the correct use or disposal of non-conforming products. Staff competency testing at least once a quarter	Records in the raw milk storage log and the results of control tests (Protocol) records of the MS check. Records of internal audit results. Records for deviations and corrective actions. Records for confirming the competence of employees
CCP 2. Pasteurization	Pathogenic microflora that survived due to violation of pasteurization regimes	The temperature should not be less than 90°C. Duration-at least 3 min	Continuous monitoring of the temperature and duration of thermograph –an operator. Check that the return valve is not up to pasteurized milk before each start of the unit –an operator	Repeated pasteurization. Isolation of unpasteurized milk. Informing the Manager to make a decision on the wrong product. Identifying the causes of nonconformity and eliminating them	Analysis of thermograms. Microbiological control and monitoring of phosphatase activity in pasteurized milk and finished products. Periodic verification and confirmation of MS accuracy (every 3 months). Checking of log records of the movement of pasteurized milk, journal of control milk from the pasteurizer, the technical journal of the work of the pasteurizer. Testing the competence of the pasteurization plant operator at least once a quarter. Confirmation of the correct use or disposal of non-conforming products and corrective actions. Internal audit	Records of temperature control and pasteurization duration. Log records of the monitoring of pasteurized milk. Test reports of finished products. Record of MS verification and confirmation of their accuracy. Entries in the pasteurized milk movement log. Record for validation of competence of the operator of the pasteurizing plant. Records for deviations and corrective actions. Records of the results of internal audits
CCP 3. Fermentation	Development of pathogenic microflora and accumulation of enterotoxins as a result of non-compliance with fermentation regimes	The temperature is not more than 22°C. The acidity of the clot at the end of fermentation is not less than 85°T (pH 4.65-4.5)	Fermentation temperature control – a fermentation operator, every 3 h. pH control – a fermentation operator, every 4 h. Temperature control of the heating/cooling agent (water) – a fermentation operator, each production	Informing the Manager to make a decision about further actions. Product testing, rejection, isolation and disposal if necessary. Identifying the causes of nonconformity and eliminating them. Additional staff training	Control of titrated acidity at the end of fermentation. Periodic verification and confirmation of MS accuracy (every 3 months).). Microbiological control of each batch of fermented mixture. Microbiological control of finished products (once a decade). Checking records in the process control log. Confirmation of the correct use or disposal of non-conforming products and corrective actions. Conducting internal audits. Testing the competence of employees of the Fermentation department and laboratory, at least once every six months	Record of MS verification and confirmation of their accuracy. Recording the temperature and acidity of the mixture. Entries in the journal of microbiological control of the fermented mixture, test reports of the fermented mixture and finished products. Records based on the results of internal audits. Records confirming the competence of employees of the Fermentation department and laboratory

Conclusion

In accordance with the requirements of ST RK ISO 22000-2006 RK 1179-2003 LLP "Breeding farm" Zerenda" of Akmola region on the technological line for the production of yogurt from goat's milk, comprising the following stages: Acceptance of raw milk, the acceptance of a fungal yeast, purification of raw milk, cooling and storing raw milk, separation, normalization, purification, homogenization, pasteurization, cooling, fermentation products, fermentation, mixing and cooling, maturation, bottling, packaging, labeling and identified threat of biological, physical, chemical factors; three critical control points have been identified at the stages of raw milk storage, pasteurization and fermentation. Preventive measures have been developed and corrective actions have been proposed for the production process.

The developed HACCP system for the production of products-kefir from goat's milk will allow the company to timely identify adverse conditions and threats arising during the life cycle in order to eliminate and timely prevent the possibility of low-quality products, which will first of all ensure safety for the life and health of the population, competitiveness at the international level, reduce the overall cost of monitoring, which will improve the company's position in the dairy market, increase the net income of the enterprise necessary for its further development.

Currently, the procedure for implementing the HACCP system in "Breeding farm" Zerenda "LLP is being completed.

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Author's Contributions

Gaukhar Yussupova and Dina Kurmangaliyeva: Conceived and planned the study.

Begjan Kalemshariv and Nadezhda Lantseva: Conducted lab work and drafted the manuscript.

Askar Muratov and Zhadyra Salykbaeva: Did statistical analysis of data.

Gaukhar Yussupova: Revised the manuscript.

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and there are no ethical issues involved.

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