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Submissions cover a wide range of issues, primarily the problem of improving management, sustainable economic development and introduction of innovative technologies, improved training and enhancement of the development of "human capital", interaction between the individual and society, psychological and pedagogical foundations of innovative education.

Materials addressed to all those interested in the actual problems of management, economy and ecology, social sciences and humanities.

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## SECTION I / СЕКЦИЯ I

### **ECONOMICS AND MANAGEMENT: PROBLEMS OF SUSTAINABLE GROWTH AND DEVELOPMENT / ЭКОНОМИКА И МЕНЕДЖМЕНТ: ПРОБЛЕМЫ УСТОЙЧИВОГО РОСТА И РАЗВИТИЯ** **135**

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### 1.3. Ensuring Food Safety in the Production of Halloumi Cheese

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#### **Abstract**

*Comprehensive monitoring of hazards and identification of critical control points at each stage of production from the moment of receipt of raw materials to the sale of the finished product is an important element of the production process, ensuring the production of high-quality and competitive products. This article presents the results of research on hazards and critical control points in the development of technology for semi-hard halloumi cheese, which allows you to manage quality and safety at all stages of its production.*

**Keywords:** halloumi, hazard factor, critical control points, safety, quality.

The level of food quality and safety are indicators of the sustainability of the food security system. To provide the production of safe, good-quality products, comprehensive control of all stages of the production process is necessary [1, p. 13-25].

Enterprises that produce food products in order to enter the world market and maintain their positions in local and national markets must ensure high quality and safety of their products.

At the department of NPJSC «Shakarim University of Semey», research was conducted on the development of technology for halloumi cheese based on goat's milk. In order to ensure stable safety in the production of this product, work was carried out to adapt the HACCP system to the halloumi cheese production technology.

For a more detailed review of the process of producing goat's milk cheese, a detailed description of each stage of the process is provided.

1. Receiving and preparing raw materials. Microbiologically, the raw material must be of good quality.

2. Pasteurization and refrigerating. Pasteurization of milk is carried out on pasteurization and refrigerating plants at t 74-76°C with an exposure time

of 20-25 seconds. In the recovery section, the milk is cooled to the coagulation temperature (32-34°C).

3. The introduction of rennet enzyme.

4. Milk coagulation and clot treatment. The grain size at the end of processing is 5-10 mm.

5. Molding. Cheese is laid out in special forms in bulk and subjected to self-pressing.

6. Cooking cheese heads in deproteinized whey for 20-30 minutes at a temperature of 85-90°C.

7. Refrigerate the cheese heads to a temperature of 35-40°C molding, salting with dry salt in the amount of 5 % and adding filler in the amount of 1%.

8. Salting cheese in 15% brine.

9. Drying the cheese for 1.5-2 hours at a temperature of 12-15°C.

10. Evaluation of the quality of finished products.

11. Packaging and packing. The finished cheese is packed in vacuum bags.

12. Storage. Store the product at a temperature of 4-8°C for 2 months, at a temperature of -18°C for 12 months.

In the dairy production, the main hazards are biological, chemical, and physical [2, p. 14-17], [3].

A risk analysis was performed for each factor in the production process. The hazards to be considered in the production of goat's milk cheese are given in table 1.

Table 1 – The potential danger in the production of cheese

Process stages, potential hazard	Controlled parameter	Valid values
Acceptance of raw materials - chemical - physical - microbiological	- content of somatic cells in 1 cm <sup>3</sup> , acidity °T - residues of disinfectants, impurities, suspended particles - QMAFAnM, CFU; purity group	- 1.0 * 10 <sup>8</sup> cells / cm <sup>3</sup> ; not lower than 14.0-21.0 °T  - not allowed  - 5.0 * 10 <sup>3</sup> ; not lower than II
Pasteurization and chilling - microbiological	- survival of pathogenic and opportunistic microorganisms	Not allowed
Adding a starter culture, enzyme and fermentation - microbiological - physical	- entry of foreign microflora - foreign inclusions due to poor-quality equipment washing, non-compliance with hygiene rules by personals	Not allowed
Clot processing, forming, self-pressing: - microbiological - chemical	- ingestion and development of foreign microflora	Not allowed

Process stages, potential hazard	Controlled parameter	Valid values
- physical	- residues of detergents and disinfectants - foreign matter	
Molding: - microbiological	- ingestion and development of foreign microflora	Not allowed
Filler addition	- ingestion and development of foreign microflora	Not allowed
Storage: - microbiological - physical	- ingestion and development of foreign microflora - foreign matter	Coliforms, <i>S. aureus</i> –not allowed in 0.001 g of product Pathogens, including Salmonella and <i>L. monocytogenes</i> are not allowed in 25 g of the product Yeast, mold – not allowed

A critical control point (CCP) – is a point, stage, or procedure where control can be applied to eliminate or reduce hazards to an acceptable level [4, p. 110-114].

The purpose of this stage is to identify points or procedures in the production process that can be controlled and that can prevent the occurrence of a hazard, eliminate it, or reduce it to an acceptable level. Critical control points were determined using the «a decision tree» method [5, p. 12].

The results of determining the CCP in the production of cheese are presented in table 2.

Table 2 – The definition of CCP in cheese production

Stage of the process	Hazardous factors	Questions				Will it be a stage of CCP
		Q1*	Q2**	Q3***	Q4****	
Milk production-raw materials	Microbiological factors: - contamination of raw materials with pathogenic microorganisms	No	No	Yes	Yes	No
	Physical and chemical properties: - contact with disinfectants and foreign materials	No	No	Yes	Yes	No
Acceptance of raw milk	Microbiological factors: - contamination of raw materials with pathogenic microorganisms	No	No	Yes	Yes	No

Stage of the process	Hazardous factors	Questions				Will it be a stage of CCP
		Q1*	Q2**	Q3***	Q4****	
	Physical and chemical properties: - contact with disinfectants and foreign materials	Yes	No	Yes	Yes	No
Pasteurization and refrigeration	Microbiological factors: - contamination of raw materials with pathogenic microorganisms	No	Yes	No	No	Yes CCP 1
	Physical: - violation of the pasteurization process parameters	No	No	No	No	No
The coagulation of milk	Microbiological: - ingestion of pathogenic microorganisms	No	No	No	No	Yes CCP 2
Self-pressing	Microbiological: - ingestion of pathogenic microorganisms	No	No	No	Yes	No
	Physical and chemical properties: - contact with disinfectants and foreign materials	No	No	No	Yes	Yes CCP 3
Cooking a wheel of cheese.	Microbiological: - ingestion of pathogenic microorganisms	Yes	No	No	Yes	No
Molding	Microbiological: - ingestion of pathogenic microorganisms	No	No	Yes	No	Yes CCP 4
The introduction of the filler	Microbiological: - ingestion of pathogenic microorganisms	No	No	Yes	No	Yes CCP 5
Salting	Microbiological: - ingestion of pathogenic microorganisms	Yes	Yes	Yes	No	Yes CCP 6
Storage	Physical and chemical: - violation of storage temperature, humidity, pH, acidity.	No	No	Yes	No	Yes CCP 7

*B1\** - is there any monitoring of the hazard factor at this stage?

*B2\*\** - this stage is designed specifically to eliminate the threat or reduce the possibility of its occurrence to an acceptable level?

*B3\*\*\** - can the identified threats or contamination at this stage exceed the acceptable levels or increase to an unacceptable level?

*B\*\*\*\** - will the subsequent stage eliminate or reduce the risk of the hazard to acceptable levels?

According to the information presented in table 2, seven critical control points were identified. In the practice of developing and operating the HACCP system, it is noted that there should be no more than 8-10 such points. Based on the analysis of hazardous factors and the algorithm for

determining the CCP that may occur at such stages of the production process as: pasteurization, milk coagulation, molding, filling, salting and storage.

Thus, in the course of this work, the existing hazards and critical control points in the production of semi-hard halloumi cheese were identified. In order to reduce the risk of producing cheese from goat's milk, it is recommended to follow the requirements of CU TR 033/2013. Comprehensive control over hazardous factors in production will reduce risks in production and improve the quality of products.

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