

OFFICIAL CONTROL OF DAIRY PLANTS AND RISK POSIBILITES IN THE MILK INDUSTRY

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Abstract

In this paper work we pay attention of the manner of official control is done in dairy plants in Republic of Macedonia, way of categorization of the plants, short aspects of the legislation that is related to the dairy industry.

In the second part of the paper work are described the possibilities of occurrence of the certain risks from food safety point of view, for the specific products that are produced in the Balkans like (Berovo white cheese, Feta cheese, sheep yellow cheese, acid milk, yogurt, airan...), product and process description of the traditional way of manufacturing - (1-2 products), with detailed analyses of all steps from the flowchart process, analyses of the possible risks in every step of the flowchart process.

Furthermore we give accent to the origin of the milk products, and the way and the conditions of their occurrence in time, traditions that they carry with them and their traditional value for the producers as well as the consumers. Also we present the relationship between consumers and traditional milk products in this region.

Key words: Official control, dairy plant, traditional milk products.

1. Introduction

The purpose of this paper work is to be useful for the food business operators (FBOs) in the dairy industry in Macedonia. It gives information about the origin and history of the milk products, but the main point is to help them to have general overview of the work of the Food and Veterinary Agency and the official controls. Also it gives some guidelines and some important points that every FBO who works in the milk sector

must follow. Furthermore in these paperwork are analyzed the most common critical control points for the dairy industry, with the useful advices for their control.

2. Origin of the milk products

The use of milk as a beverage probably began with the domestication of animals. Goats and sheep were domesticated in the area now known as Iran and Afghanistan in about 9000 B.C, and by about 7000 B.C. cattle were being herded in what is now Turkey and parts of Africa. The method for making cheese from milk was known to the ancient Greeks and Romans, and the use of milk and milk products spread throughout Europe in the following centuries (How Products Are Made/Milk [1]).

However the detection of milk residues in ceramic vessels is now considered the most promising means of detecting the origins of milking. Discovery of such residues has pushed back the earliest date for milking into the Neolithic. A study of more than 2,200 pottery vessels from sites in the Near East and Southeastern Europe indicated that milking had its origins in northwestern Anatolia. The lowland, coastal region around the Sea of Marmara favored cattle-keeping. Pottery from these sites dating from 6500–5000 BC showed milk being processed into dairy products (Evershed *et al.* [2]). Milk residues had already been found in vessels from the British Neolithic, but farming arrived in Britain late (c. 4000 BC) (Copley *et al.* [3]).

According to Greenfield [4], in the region of Macedonia secondary products revolution has occurred in late neolith 4500-3300 BC. In the flow of river Vardar, the sources are from zoo-archeological data.

There are few turning points that are very important for developing of the milk industry in the last centuries and spreading the milk and milk products in such scale today, some of them are:

- In 1863, French chemist and biologist Louis Pasteur invented pasteurization, a method of killing harmful bacteria in beverages and food products.

- In 1884, Doctor Hervey Thatcher, an American inventor from New York, invented the first glass milk bottle, called 'Thatcher's Common Sense Milk Jar', which was sealed with a waxed paper disk

In 1932, plastic-coated paper milk cartons were introduced commercially as a consequence of their invention by Victor W. Farris.

- In 1964, the all plastic milk container was commercially introduced (Bellis [5]).

2.1 Method of performing official controls in the dairy plants in Republic of Macedonia

Food and veterinary Agency of Republic of Macedonia is the official authority responsible for performing the official controls on the establishments for production of milk in Republic of Macedonia according to Food Safety Law (Official Journal of Republic of Macedonia 157/2011, [6]). The Agency performs its activities according to the legal acts which are transposed from the EU legislation.

The Agency has employed 79 official veterinarians who cover the entire territory. Each dairy plant in Republic of Macedonia is subject to approval. Before granting the approval, the Agency must carry out on the spot control. The Agency approves the establishments only if it is compliant with the hygienic requirements for food and with the other requirements imposed with the food safety legislation. The Agency grants conditional approval for a period of 3 months and provided that all requirements are fulfilled grants the approval, in case if there are non/compliances, the period may be extended for a period of 6 months and the operator must comply with all requirements for that period (Official Journal of Republic of Macedonia 157/2011 [6]).

Each dairy plant is approved according to the Veterinary Health Law (Official journal of Republic of Macedonia No 113/2007 [7]) and the Law on food safety (Official journal of Republic of Macedonia No 157/2011 [6]).

The Agency performs random controls and all milk producing establishments are subject of control once in a year in order to verify if the requirements for approval of the establishment are fulfilled and twice per year in order to verify if the requirements for safety and hygiene during milking, collection and transport are met (Book of Rule for Special Demands for Hygiene and Safety and the Manner of Performing Official Controls on Milk and Milk Products [8]). Official Inspection in Dairy plants is helped by the Check List (Table 1).

According to Book of Rule for Special Demands for Hygiene and Safety and the Manner of Performing Official Controls on Milk and Milk Products [8] and Book of Rule for Amending the Book of Rule for Special Demands for Hygiene and Safety and the Manner of Performing Official Controls on Milk and Milk Products [9], during the controls, samples are taken from each milk producer and they are analyzed for:

- Total number of microorganisms - less than 100.000/mL
- Number of somatic cells – less than 400.000/mL
- Chemical content
- Presence of antibiotics, residues and prohibited substances – according to National Control Plan for Residues for 2011.

If the dairy plant continuously in a period of three months from the first notification fails to improve the situation with increasing each of these parameters, the Agency is obliged to grant temporary ban (Book of Rule for Special Demands for Hygiene and Safety and the Manner of Performing Official Controls on Milk and Milk Products [8]).

Sampling is performed by geometrical average for a cycle of 2 months, at least two samples are taken each month (Book of Rule for Amending the Book of Rule for Special Demands for Hygiene and Safety and the Manner of Performing Official Controls on Milk and Milk Products [9]).

Table 1. Parts of the Check List for combined audit of GMP/GHP, HACCP and categorization of the Dairy Plants

Date		Assessment of the compliance			1.Remark 2.Annex 3.Corrective record
Members of the commission		A	B	N/A	
No	CRITERIA				
1	Engagement of the administration				
2	Description of the product				
3	Identification of the expected use				
4	Flowchart of the production				
5	On the spot check of the flowchart for production				
6	Risk analysis				
7	Establishing CCP Critical Control Points				
8	Establishing critical limits for each CCP				
9	Implementation of the monitoring system for each CCP				
10	Description of the corrective measures				
11	Establishing checks on the procedures				
12	Establishing documentation and record keeping				
13	Implementation of GHP and GMP				
14	Training documentation of all involved employees for the HACCP plan and control of the CCP				
Process of assessment					
1.	Initial check of the documentation				
	- Technological flowchart with specified spot for CCP				
	- Description of the product				
	- HACCP plan includes work cards and records				
	Pre/requisite programs include work cards and records				
2.	Initial meeting				
	- scope				
	- process				
	- schedule				
3.	On the spot check of the flowchart				
4.	On the spot documentary check and monitoring				
	- specification of products and ingredients				
	- Previous reports and conclusions from the HACCP meetings				
	- Assessment of the Pre-requisite programs and implementation thereof / implementing forms /				
5.	Final meeting				
6.	Assessment report				
7.	Follow-up activities				
	<i>HACCP</i>				
	II. Description of the product. / 1. If the HACCP plan includes:				
	Name of the producer/establishment and name of the product?				
	If the raw materials and the ingredients are used as defined in the Technological Documentation (standard)?				
	Temperature, on which the product must be stored, distributed or marketed?				
	Is the final consumer group defined?				
	If the flowchart of the product clear, simple and is it clearly describing all technological steps in the processing?				
	Is the flowchart checked on the spot in order to verify its accuracy and compliance with the technological process?				
	III. Hazard analysis				
	Are all steps of the production, with potential of significant risk are identified and determined? /available records for evidence/				
	Are all hazards related to each identified steps described?				
	Are the preventive control measures described and identified during risk determination?				
	IV. CCP (Critical Control Point)				
	Is the Decision Tree used during the determination of CCPs? /available records for evidence/				

- Are the CCPs registered in the checked lists? /available records for evidence/
- V. Critical limits for CCP
 - Are the critical limits established for every preventive measure for every CCP?
- VI. Monitoring procedures
 - Are the monitoring procedures, necessary measures for control of each CCP established, and are those procedures supported within the frame work of established Critical Limit?
 - Are the signatures of the responsible persons for the monitoring in the monitoring records?
- VII. Corrective measures
 - Are the specific corrective measures established for each CCP?
- VIII. Verification procedures
 - Are the procedures for the verification of proper functioning of HACCP system established?
 - Is verification of compliance with microbiological criteria performed?
- IX. Procedures for documentation and record keeping
 - Are the procedures for documentation of HACCP system established?

PRE-REQUISITE PROGRAMMES

INSPECTION OF THE ESTABLISHMENT/SITE

Establishment for primary production		A	B	C	Remark
External inspection					
Internal inspection					
Premises	their location and product and people flows allow easy cleaning and avoiding of cross contamination				
Premises	divided into clean and unclean zones /including such for wastes/				
Ceilings, walls, floors, doors and windows are well constructed and kept					
Ventilation	adequate, well fixed, no trace of condense				
Available installations for:		A	B	C	Remark
Water	an adequate supply of cold water; clear separation of potable water system and non-potable systems;				
Water	an adequate supply of hot water/steam				
Ice	an adequate supply and appropriate conditions for its storage				
Waste water disposal	disposal should not pollute the environment and infringe the respective requirements of the law				
Furnishing	well-constructed, easy to clean and well maintained – for surfaces in direct contact with food				

PROCEDURES

Safety of water and ice		A	B	C	Remark
Cleaning and disinfection		A	B	C	Remark
Personal hygiene and health status of the personnel		A	B	C	Remark
Prevention of cross contamination		A	B	C	Remark
Maintenance of equipment and outlets for personal hygiene		A	B	C	Remark
Waste management		A	B	C	Remark
Recall and traceability of foods		A	B	C	Remark
Training		A	B	C	Remark
Pest control		A	B	C	Remark
Labeling, safe storage and use of toxic chemicals		A	B	C	Remark
Transportation and storage of foods		A	B	C	Remark

A = excellent, good or with small unconformities /without risk for food safety/;
 B = large and serious unconformities, which may lead to risk for food safety in case they are not controlled; All conditions or circumstances under "B" rate require application of a plan/programme for rapid improvement. Repetitive or accumulated "B" rates may lead to a critical situation;
 C = unacceptable and critical situation for food safety. Immediate answer and corrective actions are compulsory;

Remarks	
Remark, from part.....	Comments

2.2 Significant points from the process of production of milk and milk products on which the food business operators must pay attention

1. The milk should be cooled and kept on 8 °C if it is collected by dairy plant every day, and 6 °C if it is not collected every day, during the transport the temperature must not exceed 10°C, this is not applicable if the milk is subject to processing within 2 hours after the milking (Book of Rule for Special Demands for Hygiene and Safety and the Manner of Performing Official Controls on Milk and Milk Products [8]).

2. The raw milk should not have number of bacteria colonies on temperature of 30 °C higher than 100.000/ mL or 300.000/mL in case of milk intended for preparation of dairy products and number of somatic cells count more than 400.000/mL. The raw milk must not be placed on the market if it contains residues of antibiotics more than the accepted level. In the case of processed milk, the figures should be not more than 100 000/mL bacteria colonies on a temperature of 30 °C (Book of Rule for Amending the Book of Rule for Special Demands for Hygiene and Safety and the Manner of Performing Official Controls on Milk and Milk Products [9]).

3. The pasteurization in most cases is 15 seconds on temperature of 72 °C - high temperature, or 30 minutes on temperature of 63 °C - low temperature pasteurization, or any other combination of time and temperature which can produce the same effect (Book of Rule for Amending the Book of Rule for Special Demands for Hygiene and Safety and the Manner of Performing Official Controls on Milk and Milk Products [9]).

2.3 Most common critical control points in milk processing establishments

According to the principles and conditions of Book of Rule for Procedures for Implementing of HACCP Principles from Food and Business Operators and the Manner of Verification of These Procedures by Competent Authority [10], and Book of Rule on Conditions and Equipment in the Facilities that Produce Foods with Traditional Characteristics - Cheese Obtained from Milk from Sheep and Goats [11], always have to be checked most common CCP's in the milk establishments. These most common critical control points in the milk processing establishments are shown in Table 2.

Table 2. Most common critical control points (CCPs) in milk processing establishments

Technological process step	Hazards	Hazard analysis			Control measures
		Severity	Possibili. of occur.	Is the hazard signif.?	
Reception of the milk in the case of traditional products which are not subject to pasteurization	Biological – Presence of pathogen microorganisms obtained during the previous stage of the milk processing (sick animals or inappropriate hygiene of the stables or the transportation vehicle, inappropriate maintenance or transportation of the raw milk)	H	L	Yes	<p><u>GMP</u></p> <p>The raw milk is supplied from regular suppliers (laboratory analysis of the milk during the procurement)</p> <p>Log book for incoming raw materials (raw milk)</p> <p>Control of raw milk during introduction (temperature, acidity etc.)</p> <p>Monitoring of raw milk-protocols from analysis in accredited laboratory</p> <p>Transportation exclusively used for raw milk (isolated cisterns, which are in good hygienic condition)</p> <p>The reception is performed by trained personnel fulfilling the rules for personal and manufacturing hygiene</p> <p>Control of incoming raw materials (raw milk)-protocols for analysis with Rapid tests for inhibitory substances for each incoming party (lot) of raw milk</p> <p>Monitoring of raw milk –protocols from analysis in accredited laboratory</p> <p>Proper usage of the means for cleaning and disinfection</p> <p>The milk is subject to filtering during which the physical contaminants are eliminated.</p>
	Chemical – Presence of antibiotics and sulphonilamides, pesticides and herbicides, residues of means for cleaning and disinfection and other means used in the previous stage or in the establishments (contamination of the equipment used during the reception of the raw milk)	M	L	No	
	Physical – Presence of physical hazards obtained during the previous stage of the milk processing	L	M	No	

Pasteurization (Temperature 100 °C, 0.01 sec.) (Temperature 89 °C, 1sec.) Temperature 75 °C, 15 sec. (Temperature 66 °C, 30 min.	Biological - In case of inappropriately carried out process of pasteurization in respect of the temperature or the duration, pathogen microorganisms may be developed which have been obtained during the previous stage of the milk processing (low level of hygiene of the personnel at the farm level, keeping, transportation or after the reception of the raw milk), from the personnel in case of failing to comply with the rules for personal and manufacturing hygiene or from the used inventory	M	M	Y	<u>GMP</u> The pasteurization is performed in closed automated system, by trained personnel fulfilling the rules for personal and manufacturing hygiene (the equipment is calibrated) The establishment is subject to daily controls of the temperature and the duration of the process of pasteurization, by trained personnel registering the results in the control book Guidelines for using means for disinfection Procedure for control of the contact surfaces of the equipment for residues from the used means for cleaning, washing and disinfection
	Chemical - Presence of residues from the used disinfectants during the cleaning, washing and disinfection of the contact surfaces of the equipment	M	L	No	
	Physical - no				
Keeping of final products (temperature - 4 °C)	Biological - Development of pathogen microorganisms remained from the previous stage of the processing, in case of inappropriate performance of the process of maintaining the proper temperature.	M	M	Yes	<u>GMP</u> The temperature in the cooling chamber is monitored on daily basis by trained personnel performing visual control of the indicator at least three times per day, periodically measures the temperature of the product which is kept and registers the results in the control book. The placing of the final product for keeping is performed by trained personnel in accordance with the FI – FO rule, and the crates with the final products must be placed in such a way that they enable continuous air flow.
	Chemical - no				
	Physical - no				
Maturation of cheese which is obtained from raw milk (Berovo cheese). The maturation process must be at least 3 months.	Biological - Development of pathogen microorganisms (<i>Brucella</i>) remained from the previous stage of the processing, in case of inappropriate performance of the process of maintaining the proper temperature.	H	L	Yes	<u>GMP</u> The temperature in the cooling chamber is monitored on daily basis by trained personnel performing visual control of the indicator at least three times per day, minimum for three months The placing of the final product for keeping is performed by trained personnel in accordance with the FI –FO rule, and the crates with the final products must be placed in such a way that they enable continuous air flow.
	Chemical - no				
	Physical - no				

3. Conclusions

Main points and conclusions that derive from this paperwork are that there are laws and rules that must be followed in the field of Dairy industry in order to reach better safety and quality of the food. For that purpose the Official Veterinarians and the FBOs have to work together in the name of food safety and food quality, and hopefully the results that will come out of this cooperation will be a great benefit for the final consumers. But still, there should be a mutual respect between them in order to maintain these standards.

4. References

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