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Good Milk Handling Standards Implementation in Milk Collection Centers and Good Manufacturing Practices in Dairy Processing Plants

KOSOVO CLUSTER AND BUSINESS SUPPORT PROJECT

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PURPOSE OF ASSIGNMENT

The purpose of this assignment is to recommend the implementation of GMH standards in one model Milk Collection Center (MCC) including providing written procedures for each step of raw milk handling and testing. This MCC will serve as a model to other MCCs and be used in trainings for their staff. The KCBS Project surveyed 10 MCCs using a standard questionnaire to identify their strengths and weaknesses. On the basis of these questionnaires the STTA and KCBS will select three MCCs for assessments and site visits to determine which one to use as a model to implement/improve GMP.

BACKGROUND

Milk production is widespread throughout Kosovo and improvements in the production, collection, processing and distribution of milk will lead to added income throughout the rural sector.

The Kosovo dairy sector is poised to take a giant step forward with the increased production of high quality milk. This production must be accompanied by the manufacturing and marketing of high quality dairy products. The dairy sector is a prime example of how an industry must progress in terms of basic procedures and systems and newer technology or be left behind in the world market. A focused approach that brings new technology and introduces good milk handling and manufacturing practices throughout the industry is critical to raising Kosovo's dairy industry to the next level of competitiveness.

The KCBS Project currently has nine commercial dairy processing companies as clients. In total there are more than 25 dairy processing companies operating in Kosovo. Located throughout Kosovo, these dairies have a total processing capacity of 85,000 liters of milk per day. This processing capacity could easily be increased to 100,000 liters a day with minor upgrades to existing equipment. The capacity ranges from 1,000 liters per day in the smallest dairies, to 30,000 liters per day in the largest. They supply a very limited range of dairy products to the domestic market. Presently, imported dairy products have a significant share of the domestic market. In response to increased competition from imports, local dairy processors are attempting to develop new products of their own. These new products require higher quality raw milk and better milk handling, manufacturing, and distribution practices.

Two systems are used for collecting raw milk. The first involves the dairy processor collecting milk directly from the larger commercial farms. The second requires small farmers to bring their milk to a central, privately operated Milk Collection Center (MCC). Dairy processors Abi, Devolli, Ajka, Rona, Kabi, and Bylmeti are currently collecting milk from 55 MCCs with milk cooling tank capacities of 1000 lit/each. The dairy processors' demands for better quality milk are putting increased pressures on MCCs to supply higher quality milk. Presently in Kosovo there is no MCC operating with Good Milk Handling (GMH) standards. There is also a general lack of GMP (Good Manufacturing Practices) being standardized and followed in the processing plants. This inconsistency throughout the dairy food chain results in products of variable quality and inconsistent taste.

EXECUTIVE SUMMARY

The Dairy Specialist joined additional consultants from KCBS to provide technical assistance and training managers and staff of MCCs and dairy plants throughout Kosovo. The team worked in Pristina, Peja and Prizren for a 12-day period during the month of August 2006.

A large number of MCCs and dairy plants are managed by young inexperienced workers or by farmers with insufficient knowledge of GMP. This is the main factor leading to unsafe products and limited shelf-life of products which directly correlates to the economic balance of dairy plants. The main problems which lead to such conditions are: low product quality, non standardization of products, unsafe products and low competition potential.

Target group of the project were MCCs that fulfilled the technical conditions for raw milk receiving and dairy plants that have invested in implementation of GMP improvements of facilities and other necessary equipment.

During the 12-day period, four MCCs and three dairy plants were visited. Almost all persons who attended the meetings were directly involved in the management process. Managers were educated on different topics for GMP management such as: good hygiene practice at the dairy plants, management of MCCs, record keeping, cleaning procedures, and proper working habits to minimize the possibility of cross contamination.

GMP was initiated at three dairy plants using the 1+2 model. This model indicates that one dairy plant, Ajka, with the resources and capabilities required for implementation, will serve as a model to two additional dairy plants, ABI and RONA. The main topic of the workshops was Good Manufacture Practices with the following sub topics: milk receiving and cooling, pasteurization process and temperature control, hygiene of workers and equipment, product cooling and mastitis in dairy cows. All procedures that are important for production of standard products were practically demonstrated. Critical points that effect the microbiological quality of the products was pointed out starting with preparation of the starter culture through to the sale of products.

GMP implementation was discussed at four MCCs with the goal to increase the hygienic level at the collecting centers and to maintain the milk quality up to the moment of delivery to the dairy plant. The following topics were included in the discussion: selection of proper cleaning chemicals and equipment for cleaning the enterer, milk equipment and utensils; procedure for cleaning the milk equipment; disinfection of the enterer, equipment and utensils; proper sampling for microbiological and chemical analysis; application of blue methylene test and evaluation of the results; training for handling with Lacto scan and pH meter.

Due to the influence of microbiological quality of raw milk on the quality of dairy products and their competitiveness on the market, the need to implement a payment system for raw milk according to microbiological and chemical quality was discussed with the managers of four dairy plants: AJKA-Prizren, Abi-Prizren, Goljaj and Rona. They were presented with the European standards for raw milk quality for collection and transport and also the standards for premises for intake and further processing the milk. The need for establishing at least one independent laboratory in Kosovo for raw milk and dairy products testing was also emphasized.

FIELD ACTIVITIES TO ACHIEVE PURPOSES

In order to have a clear understanding of the current situation in various MCCs and dairy plants, the consultant visited several facilities in Kosovo. The consultant also discussed the current situation in the sector with the main stakeholders in order to educate them on the importance of GMH and GMP implementation.

1st August 2006: KCBS Project Office
The consultant met with KCBS Project staff to plan the schedule of activities for the assignment. The goal was to visit and select client(s) which in future will implement GMP and start with recommendations for future activities which are necessary to implement Food Safety Standards. Visiting plan included dairy plants and MCCs. During this time the consultant also contacted BIOLAB to discuss services which they provided to dairy farmers and MCCs.

2nd August 2006: Ajka Dairy Plant, Rugova and Kruseva MCCs
Met with Mr. Ramadan, owner of Ajka dairy plant, to discuss KCBS project activities related to the implementation of Food Safety Standards and GMP. Mr. Ramadan agreed to start with implementation of GMP standards which will be recommended by KCBS consultants and asked the project to help them to improve quality of soft white cheese.

After the Ajka visit, the consultant visited two new milk collection centers in Rugova and Kruseva to discuss possibilities for collaboration. Neither of the MCCs is operational at this time, but both are working towards the final equipment installations and have agreed to manager training before the commencement of milk collection.

3rd August 2006: Ajka Dairy Plant
A return visit was made to Ajka dairy plant to check all procedures for milk processing from receiving to packing. Procedures were checked procedure for:

- Milk receiving - milk without cooling is transferred in a 1200L capacity lacto-freezer
- Storage - the same lacto-freezer used for cooling and storage.
- Processing - during pasteurization process it is difficult to control temperature.
- Packing -packing equipment for yogurt and set yogurt is automatic and for pasteurized milk is semiautomatic.
- Storage - the cooling chamber satisfied needs for storage
- Soft white cheese - there are some mistakes being made which result in poor quality of the final product.

4th August 2006: Ajka Dairy Plant and BIOLAB Consulting
During this visit the consultant developed a new procedure for soft white cheese, prepared a starter culture for demonstrating cheese making procedures and inspected the plant. During a meeting with the necessary changes were discussed on proper steps for GMP implementation. The biggest investment will be a pasteurization unit together with homogenization and separator. Also the receiving station has to be upgraded and a cool water and hit exchanger installed.

The next meeting occurred with BIOLAB consulting to discuss future cooperation in GMP implementation and share necessary information relevant for project.

5th August 2006: Ajka Dairy Plant
Working with 1200L of cow milk, the consultant made cheese to demonstrate the complete procedures for cheese making - from milk receiving to cheese salting. All mistakes in procedure for cheese making were discussed. Each day, the plant owners were introduced to GMP requirements and improvements which have to be done in future.

7th August 2006: ABI Dairy Plant
We met with the owner of ABI to discuss the current situation of plant and gain and understanding of the privatization process which will be completed by the end of this year. This company has a strong position in the market, understands the benefits of GMP and is ready to implement standards.

8th August 2006: ABI Dairy Plant and Mamusa MCC
We organized a meeting with the general manager of ABI to explain the process of GMP implementation and activities which will be done in future. He agreed to employ one more person who will be responsible for the Quality Control Department and have a crucial role in GMP implementations.

After meeting with ABI we visited the MCC in Mamusa. This MCC has moved to a new location which is much better situated than the first one.

9th August 2006: Bec MCC and RONA Dairy Plant
We met with Musa Cerim, owner of the MCC in Bec. This MCC also has equipment for milk pasteurization and cheese making. The equipment has never been used and they asked for KCBS assistance and training in procedures for cheese-making.

We met with the general manager of RONA dairy plant. RONA plans to build a new facility in 2007 and anticipates KCBS assistance with this effort for equipment lay out.

10th August 2006: Goljaj Dairy Plant
This was the first visit to this dairy plant. Goljaj processes around 2000L of cow milk per day. We discussed with the owner procedure for milk receiving, laboratory testing, processing. The plant facilities and equipment satisfied GMP standards. This is the only dairy plant in Kosovo which currently posts charts recording temperature of pasteurization and divert valve. During the meeting future activities of KCBS project were explained.

11th August 2006: MCCs in Peja, Rausic and Istog
The Goljodjan-Peja MCC is in good shape and possesses all necessary equipment for milk testing except test for inhibitors. The second MCC is located in Rausic and is owned by Mr. Abedin Kastrati. The third MCC, in Istog, has a good operation and collects milk for two dairy plants.

12th August 2006: Ajka Dairy Plant
A follow-up visit was conducted to check the cheese production process during fermentation process and make further recommendations for GMP implementation.

14th August 2006: KCBS Project Office
The consultant met with the Kosovo Dairy Processors Association, Vet Animal Service, Vet Public Health, and one of the managers of RONA dairy plant Rona to discuss Milk Quality Systems.

TASK FINDINGS AND RECOMMENDATIONS

At the selected dairy plants, managers and workers were trained on: transportation and milk receiving, laboratory testing, milk cooling and storing, pasteurization process, recording and controlling, cleaning procedures.

Activities at each model dairy plant proceeded in accordance with the following schedule:

1. *Milk transportation*: each dairy plant recorded the defects at milk collections process, milk testing during collection (acidity and temperature), milk transport equipment, and cleaning procedure.

2. *Milk receiving and testing:* During milk receiving process the consultant explained procedures for milk reviewing and provided a list of necessary equipment for it. Cooling the milk to a temperature below 8ºC limit the number of micro organisms and maintains the microbiological quality. The dairy plants all have some of the necessary equipment, but some of it is old or missing and must be replaced. If these plants want to increase the quality of the final product, they have to reduce the length of the milk cooling phase and invest in milk receiving equipment. The filtration process is also one of the major problems because at the moment, the stainless steel filters that are being used do not satisfy filtration needs.

   Laboratory testing of raw milk is conducted during milk receiving. The dairy plants are using standard techniques for milk testing, but the problem is that the test and solution is not standard. The testing equipment needs to be calibrated and solution for milk acidity testing is old. They also do not have written procedures for all laboratory tests and schedules for calibrating equipment.

3. *Milk pasteurization process:* Proper milk pasteurization and recording processes were demonstrated. Currently only one dairy plant posts the divert valve and temperature chart recorder. The temperature recording and divert valve are Critical Control Points and must be in place and checked daily before starting the pasteurization process. Most of thermometers are not calibrated therefore making it difficult to control pasteurization temperatures.

4. *Cleaning procedure and pest control:* The following proper operating procedures were demonstrated using adequate tools and chemical solutions:

   - Preparing area, equipment and personnel for cleaning
   - Pre-cleaning - physical (dry)
   - Pre-rinsing
   - Chemical cleaning with acid or alkaline (chlorinated) detergents
   - Inspection and re-cleaning, if necessary
   - Sanitizing

   Currently none of the dairy plants have plans for pest control. For GMP implementation pest control conducted by professional companies is crucial. Dairy plant managers must be educated on this.

5. *Product storage and distribution:* All of the dairy plants have cooling chambers for final products. Temperature controls are visually checked by workers, but no evidence of temperature probe calibration exists. Because the temperature of final product is very important for shelf life and safety of product we recommended data loggers for each cooling chamber. With 24-hour temperature recording information the manager can locate problems which are connected with product cooling. The same type of data loggers can be used for distribution tracks. At the end of each week all record information can be analyzed and improvements made if necessary.

Training was conducted at the Milk Collection Centers for permanent and temporary employees. The goal was to increase the hygiene level at the collection centers and to maintain the quality of the milk until distribution to the dairy plant. During the training, demonstration was performed on:

1. Proper sampling and labeling the samples of the milk for chemical and microbiological analysis, refrigerator storage at 0-4^{o}C and transport of the samples at a temperature of 0-4^{o}C in sterile and well closed containers;
2. Control of the temperature during intake of the milk from the farmers;
3. Selection of proper cleaning chemicals for cleaning and disinfection of the premises, equipment for storage the milk and other assisting utensils;
4. Introduction of procedures for cleaning and disinfection of the premises and equipment at the collecting center;
5. Introducing methylene blue test as orientation control of the microbiological quality of the milk: preparation of 0, 1% solution of methylene blue, testing of the milk, evaluation of the results from testing and classification of the milk according the test;
6. Preparation of the alcohol test for determining the freshness of the milk: preparation of 68-70% solution of ethyl alcohol, testing of the milk and proper evaluation of the results form the test;
7. Usage of Lacto scan for determination of the chemical parameter of the milk, proper evaluation of the results and procedure for cleaning the instrument;
8. Usage of pH meter: calibration of the instrument, testing the milk, evaluation of the results and cleaning of the probe of the instrument;
9. Preparation of the titration method with the solution of NaOH for determining the acidity of the milk: preparation of the solution NaOH, testing the milk and evaluation of the results form the test.

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE ACTIVITY

Currently none of the processors in Kosovo have GMP implemented in their facilities. Food safety is one of the top priorities for food processors and also one of the factors for consumer confidence and due diligence. Other countries in the region have already initiated implementation of these standards and in some countries all of the processors are certified in food safety standard implementation. This fact makes processors in Kosovo uncompetitive when compared to neighboring countries. For now, local consumers have higher confidence in imported products.

For these reasons it is essential that the processors in Kosovo start and continue with implementation of food safety standards as soon as possible. The implementation of these standards is critical not only for domestic but for export market as well. Certification on food safety standards will increase product assurance and facilitate the export of dairy products to EU countries.

Recommendations are as follows:

1. GMP implementation to be carried in the selected dairy plants. This means that the client of KCBS - Dairy Plant ABI that has required resources and capability can be the best for implementation and the other two (Goljaj and Ajka Diary Plants) will follow its example.
2. Currently it is not possible to assess which processors have the determination to start with implementation of food safety standards and it will require additional monitoring time to decide which client will have results in the implementation process first.
3. The same recommendation refers to MCCs, which means that two milk collecting centers will serve as example to other two.
4. It is necessary for the dairy plants and milk collecting centers to recognize the need for laboratories to perform chemical and microbiological tests for their products.
5. In order to fulfill the above mention recommendation it is necessary that the future training is provided to the Veterinary inspectors, dairy companies and KCBS Project employees.

ANNEXES

Annex I Detailed Equipment List for Milk Collection Centers

Annex II Detailed Equipment List for Dairy Plants

ANNEX I: DETAILED EQUIPMENT LIST FOR MILK COLLECTION CENTERS

Facility: Ensure that the buildings are of adequate size and are designed and built to facilitate maintenance, cleaning and sanitary operations, prevent entry of insects and other animals, facilitate waste treatment and disposal, and prevent mix-ups and cross-contamination.

Equipment
- Milk receiving pump with filter
- Plate heat exchange with ice water generator or lactofrizers
- Food grade tube for milk receiving and manipulation
- Temperatures display and data recording
- Hot water -boiler

Laboratory
- Thermometers
- Alcohol probe
- Containers for tacking samples
- Mastitis probe
- Antibiotic and Inhibitor tests
- PH meter
- Refrigeration unit for milk samples storage

Cleaning solutions
- Acid solution
- Alkal
- Disinfection

Pest control
- traps for mouse, flay killer units

Documentation
- Written procedure for all laboratory procedure
- Pest control plan
- List of farmers and records
- Written procedure for coding system
- Written procedure for milk receiving, storage
- Records for training
- Standards for milk
- List of equipment
- Plan for calibration
- Cleaning procedure and records

Maintains
- Plan for maintains
- Records for maintains
- Contract wit external company

ANNEX: II DETAILED EQUIPMENT LIST FOR DAIRY PLANTS

Every natural health product shall be manufactured, packaged, labeled and stored using equipment that is designed, constructed, maintained, operated and arranged in a manner that

a) permits the effective cleaning of its surfaces;
b) permits it to function in accordance with its intended use;
c) prevents it from contaminating the natural health product; and
d) prevents it from adding an extraneous substance to the natural health product.

To meet the requirements manufacturers, packagers, labelers, importers and distributors must do the following.

1. Ensure that production equipment is designed, constructed, installed and maintained to facilitate cleaning, sanitizing (where appropriate), and inspection of the equipment and the surrounding areas. Specifically, this means the following:
    a. establishing and following procedures for cleaning and maintaining equipment and utensils used to manufacture products;
    b. avoiding temporary repairs (e.g. with tape); and
    c. clearly labeling defective equipment as such.
2. Ensure that production equipment and utensils having direct contact with materials and products are constructed of smooth, non-reactive and non-toxic materials, and are designed to withstand repeated cleaning.
3. Minimize the possibility of lubricant or other maintenance materials contaminating the products by ensuring proper equipment design (e.g. tanks, chain drives and transmission gears must be enclosed or properly covered).
4. Control and monitor temperature-sensitive compartments, and keep records of this work.
5. Properly maintain instruments and controls, including laboratory equipment, to ensure that they remain accurate, and retain records of this work.
6. Develop a calibration program for critical manufacturing, packaging and testing equipment, and maintain records of this work.
7. Maintain records of equipment and facility cleaning.
8. Maintain equipment usage logs.

LIST OF EQUIPMENT:

Milk transportation

- Isolated inox tank for milk transportation
- Field equipment for milk measurement and acidity testing -alcohol probe or Ph meter
- Milk transfer pump
- Equipment for milk measurement

Laboratory

- Acidity testing equipment -Ph meter and titrated
- Inhibitors and antibiotics testing equipment
- Thermometers
- Refrigeration unit for milk samples storage
- Containers for tacking milk samples

Milk receiving and storage

- Milk pump with filter

- Plate heat exchanger
- Ice water
- Isolated milk storage tanks

Milk pasteurization unit
- Temperature control
- Continue temperature chart recorder
- Divert valve
- Holding tube
- Homogenization
- Separator

Yogurt fermentation tanks
- Temperature probe
- Isolation

Pasteurized milk tank
- Isolation

Packing line for: Yogurt, set yogurt and pasteurized milk

Cooling chambers
- Isolated and easy clean
- Data logger for temperatures recording

Track for distribution
- Isolated
- Temperature control
- Data logger for temperature control

CIP system for cleaning -Transport tanks and separate for dairy plant
- Acid
- Caustic