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Raw Cow Milk Quality: Relationship Between Antibiotic Residues And Somatic Cell Count

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***Abstract*—The purpose of this study is to evaluate the relationship between antibiotic residues and somatic cell count (SCC) value in raw cow milk. The milk samples (n=180) were randomly collected during summer and winter seasons from dairy farms in Albania. In this study the presence of antibiotic residues in raw cow milk, SCC value, and relationship between milk SCC and antibiotic residues value in raw milk are investigated. Drugs used in animal farms can affect the public health because of their trace in edible animal tissues. Antibiotics are an integral part of treatment in many infectious diseases. They are widely used therapeutically as growth promoters and to prevent infection in animals. Antibiotic residues are important for three major reasons. First, they can cause antibiotic resistance in microorganism. Second, antibiotics have side effects therefore; feeding of edible products containing Antibiotic residues can cause similar complications. The possible complications can be from slight and transient changes in the body's natural flora to severe allergic reaction. Third, the bactericidal and bacteriostatic activity of these compounds can interfere with the production process of some dairy products.**

***Keywords*—Milk, Beta lactam, rapid test, public health, DeLaval database Kitt DCC.**

I. INTRODUCTION

Expansion of the market in Albania, including the availability of a variety of imported dairy products has made the Albanian customer more demanding about the quality and safety of products supplied. In recent years the dairy industry has undergone major transformations in an effort to become more competitive in terms of quality and benefits for manufacturers [1]. Regular testing of the quality of raw milk is an important instrument for the development of the dairy sector and the consumer's protection. The parameters for assessing the quality of milk are fat, protein, lactose, and parameters for safety, Total Bacterial Load (cfu/ml), the number of somatic cells (cell/ml) and the remains of antibiotics [2]. Total quality control of milk is an essential component of the dairy sector and should be performed for some reason. First, it helps farmers, collectors, processors and other stakeholders involved in the milk productive chain to determine the condition of the quality as well as the weak points in their ongoing activities. Secondly, it helps the organizations involved in monitoring the quality of milk to meet the consumer's expectations for a final product of high quality, safety and biological value [3]. *Milk, being a complex mixture of nutrients, with a high content of water and an approximately neutral pH, may suffer negative changes very quickly. It is a very favourable for microbial growth, especially pathogenic bacteria [4]. Depending on undergoing manipulation, biological and physico-chemical properties of milk can vary quickly from the activity of microorganisms. Thus, the number of bacteria in milk, directly influences the quality and safety of dairy products* [5]. Outbreaks of food illnesses associated with the consumption of milk are often verified with the presence of pathogens that cause breast infection [6]. Mastitis is the most prevalent and expensive disease in farm milk production. Knowledge of the prevalence and distribution of pathogens is important for preventing disease and determining the number of somatic cells as an important indicator in public health impact. Veterinary drugs are pharmacologically and biologically active chemical agents especially for the treatment and prevention of animal diseases. Currently, veterinary drugs are widely used to protect animal health. This is associated with tremendous growth and intensification of animal production. Antibiotics and other medications are used to combat antibiotics in milk. The test consists in connection of protein through a new technique that eliminates the need for block heater. Because this test requires no other additional equipment, it is more practical for various diseases. The most useful and most frequently used in veterinary drugs are antimicrobial agents [7]. In some cases these are also used as supplementary food. A crucial change in the use of complementary agents designated as antibiotic growth stimulators has been brought by Regulation of the EU imposing a ban on further use of these agents for animal nutrition as from 1-st January 2006 [8]. In lactating cows, microbial agents are used primarily for the treatment of mastitis but also to other diseases (respiratory diseases, metritis etc.). Prolonged use of antimicrobial is used in the treatment of dry cows [9]. Antibiotics used to the cow during the lactation can

pass into breast milk at different level. A source for the contamination of milk is itramammary infection and different antibiotics used for treatment. A frequent and prevailing source of the milk contamination is the intramammary administration of a specific antibiotic. Other pathways for milk contamination are cutaneous, subcutaneous, intramuscular and intravenous, drug administration [10]. In many countries, veterinary medicine is allowed to be used only to those agents that are officially registered and approved. In drugs which are registered and approved for use on food producing animals, protection periods are prescribed during which, the quantity of residues in foodstuffs of animal origin (meat, eggs, and milk) should be reduced to a level unthreatening to the consummator's health.

II. MATERIALS AND METHODS

2.1 SAMPLING

The study was conducted in 13 small farms in the region of Lushnja, Fier and Kavaja during the period of March– June 2015. In this region there are also major national issues in the livestock industry and milk production. In accordance with criteria, the detection of inhibitory substances in milk was carried out using a rapid diagnostic system Auro Flow™ Strip. Tests enabling the determination of antibiotic in the beta-lactam antibiotics of the tetracycline group -beta-lactam. Samples of milk milked at night and in the morning were transported under refrigeration conditions to the Laboratory of Control of Animal Origin Products, Faculty of Veterinary Medicine Laboratory of Food Microbiology and Veterinary. The samples were sent to the Institute (FSVI "Bilal Golemi") at lab of Food Microbiology within 2 hours of the receiving. The test results for detectives of antibiotic in raw milk were: 16/180 (9%) of milk samples resulted strongly positive, while 26/180 (14%) of samples were slightly positive and 138/180 (77%) of samples were negative. These results were similar to the results from the Veterinary Medicine Laboratory of Food in the Faculty of Veterinary Medicine.

*2.2 Sample preparation.*The detection of inhibitory substance in milk was carried out using rapid diagnostic test AuroFlow™ kit Beta- Lactam, Tetracycline is rapid test which is based on the lateral flow strip sample and detection on refined at the collection points, farms etc., Figure 1. Protocol analysis eliminates the need for block heater.

Strip Testing Procedure

1. Using scissors, carefully cut the number of reaction wells and remove test strips appropriate for the number of samples that will be tested and allow reagents to reach ambient temperature (25˚C +/- 5). Ensure that unused wells remain firmly capped. Promptly re-store the remaining components at 4˚C.
2. Shake the milk vigorously to ensure sample homogenity.
3. Attach a disposable pipette tip to the end of the pipette (Cat # 106711).
4. Insert the pipette tip into the milk sample, depress the plunger of the pipette to the first stop and then slowly release the plunger to aspirate 200 ml of milk into the pipette tip. Position the pipette tip (loaded with milk) over a reaction well and depress the plunger to completely expel the milk sample into the well. When more than one sample
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8. Position the pipette tip (loaded with milk) over a reaction well and depress the plunger to completely expel the milk sample into the well. When more than one sample is being analyzed, note the order in which they are placed in the wells.
9. Using the same pipette tip aspirate the sample up and down about 10 times to completely suspended the lyophilized reaction particles in the milk, while avoiding bubble formation. The sample should turn a uniform pink colour. After suspended the particles, remove and discard the pipette tip.
10. Incubate the sample for 3 minutes at ambient temp (25˚C +/- 5). During this time, label one or more test strips as needed for the number of samples being tested.
11. After 3 minutes, insert the bottom of the test strip into the well containing the milk sample (see Figure 1). The strip should be inserted such that the arrows are pointing down. Be sure the strip is oriented vertically (not leaning to the side) and is inserted all the way to the bottom of the well. Set a timer for 4 minutes.
12. After 4 minutes, remove the strip and place it on a horizontal surface with the unmarked side facing up.
13. Immediately visually examine the intensity of the signal at each test line and compare the intensity to the C-line.

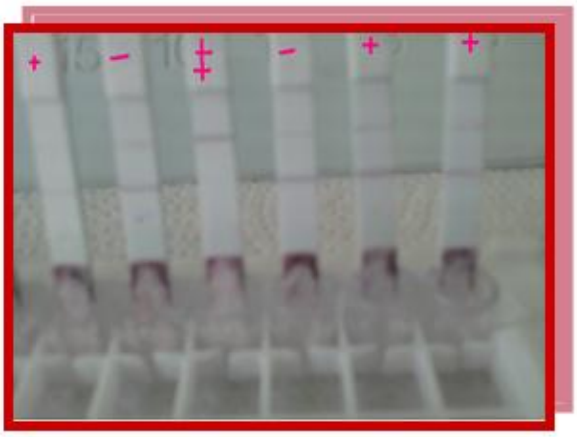

Figure 1. Samples from antibiotics in raw milk

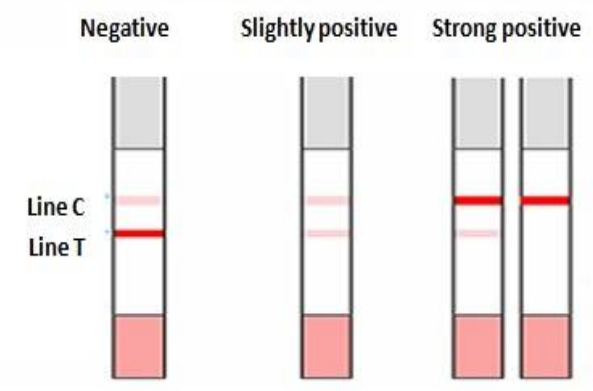

Figure 2. Representative Results

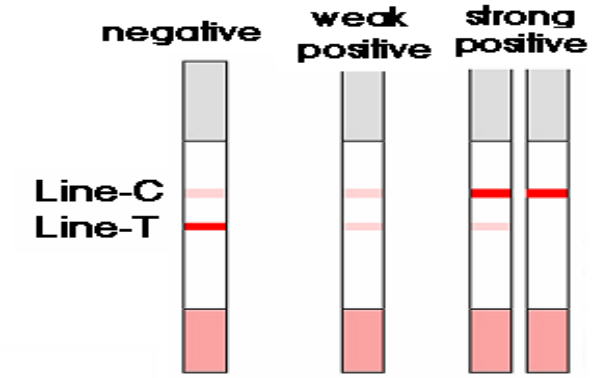

Figure 3 138/180 (77%), 26/180 (14%), 16/180 (9%).

Table 2. Results of AuroFlow™ kit

Result	Samples 180
Negative	138/180(77%).
Slightly positive	26/180(14%).
Strongly positive	16/180 (9%).

A rapid test for the determination of Beta-lactam and tetracycline sensitive is made using the Kit in accordance with EU standards for the group of 13 beta-lactam and tetracycline.

III. INTERPRETATION OF ANTIBIOTICS RESIDUES

- Signal at a test line which is more intense than or equal to the signal at the C-line indicates the milk sample is negative for presence of that category of antibiotics.
- Signal at a test line which is clearly less intense than the signal at the C-line indicates the presence of that respective category of antibiotics in the milk sample
- If the signal in C is the same intense or more intense than the T line then milk samples containing these groups. (Figure that have cases positive, negative, positive and strong).

It took 180 samples in the study from which 16/180 (9%) milk samples resulted strongly positive, slightly positive while 26/180 (14%) samples and 138/180(77%) negative. .

3.1 Milk SCC.

In many regions, the SCC is used to define financial incentives paid for high quality milk and herd shipping milk containing high levels of somatic cell may have a significant financial disadvantage [12]. Many studies have consistently identified a relationship between SCC and the level of antibiotic reduces [13]. The SCC can be an indicator to recognize mastitis [14]. A somatic-cell lower number of somatic cells means: low total bacterial load, low incidence of mastitis, reduced antibiotic use and the possibility of reduced *antibiotic residues in milk. These indicators suggest a lower cost of production because producers do not need to spend for treatment and medication.*

Figure 4. Electronic Counter DCC DeLaval database kit

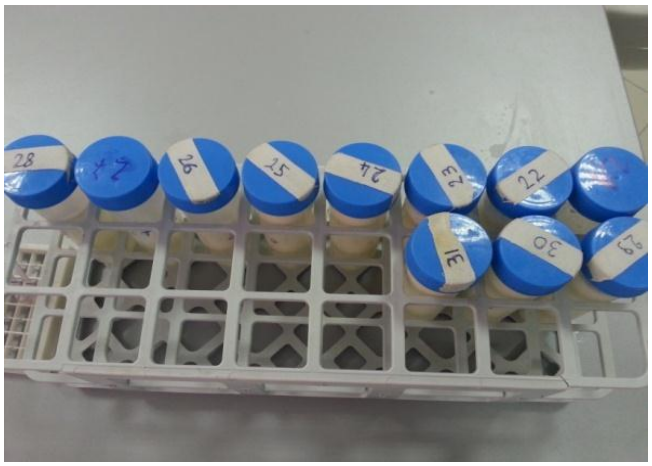

Figure 5. Samples from raw milk

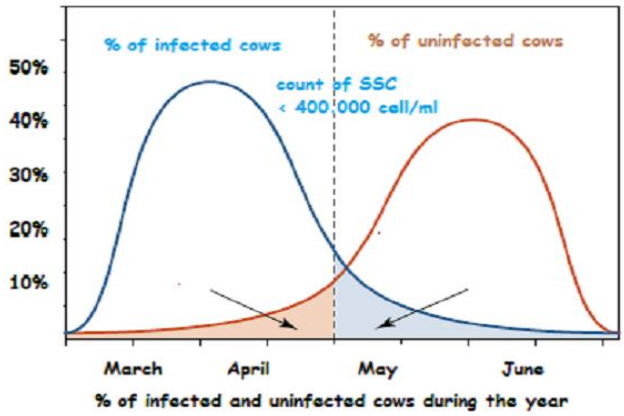

Figure 6. Percentage of infected milk during March-June

IV. RESULTS

For somatic cells we have used ISO method 13366-1: IDF 148-1. To determine the number of somatic cells electronic Counter DCC DeLaval database kit was used. This is a simple method and gives results in a few minutes. Results were 42/180 on the limits (≤ 400.000 cell / ml). The SCC value was significantly higher for milk samples with positive antibiotic residues.

V. CONCLUSSIONS

- Through this rapid method we verify the presence of antibiotics in milk. The risk of the presence of antibiotics in milk should be considered important and occasional monitoring of milk should be done, according to the regulations and standards of BE. Milk can be considered cheap but is expensive.
- Veterinary drug residues in milk represent a health risk to the consumer. The purpose and strategy of the antibiotics and sulfonamide detection in milk include two different aspects: the ability to sell the milk depending on its quality (technological safety) and liquid milk with high SCC has reduced the term of preservative and values for traits/characteristics (taste, quality) are generally low.
- Increasing the level of humidity, increases SCC in cheese and reduces cheese yields with adequate moisture. Monitoring the quality of milk in dairy farms under study, we believe that will be a subsidiary for the competent authorities to be able to act in preventing the entry into the food chain of products harmful to health, by respecting the customer and applicable legislation [11].
- At the same time the milk in this region will be able to avoid the economic damage caused by such products, which have a negative impact on public health, as well as the dairy processing industry.

Researchers have identified a consistent relationship between SCC and the occurrence of antibiotic reduces. Intervention that reduce the prevalence of subclinical mastitis and therefore reducing the need for antibiotics may have an added benefit of further reducing the risk of antibiotic residues. .

ACKNOLEDGEMENT

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