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Hygienic Quality of Cow Milk, in Various Bovine Breeds of Tiaret Area (Algeria)

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Abstract: The aim of this study is to determine whether the milk produced locally is of good quality. The assurance of microbial quality of milk was done by evaluating 155 samples of milk, from production point. Present study lasted from 01-03-09 to 01-03-2010. This study was also based on a search of germs in our milk samples analyzed. Among 155 samples of raw milk analyzed, A FAMT > 105 CFU mL⁻¹ was found in 81.2% of our samples; The fecal coli forms account for 18.06% among all the bacterial flora isolated from our milk samples; *Staphylococcus aureus* and *Fecal streptococci* are present in 81.93 and 80.64%, respectively. The evaluation of the quality of milk produced locally has shown that the latter is of poor quality and do not meet the required criteria.

Key words: Dairy cow, culture medium, contamination, *Staphylococcus*, coli forms, production

INTRODUCTION

Milk quality, which is a major constituent of the diet, is considered essential to the health and well being of the community (Prejit-Nanu and Latha, 2007).

Milk may contain some varieties of microorganisms at the exit of the breast; Thus, milk can also be contaminated at various levels, either at cow itself, at milking time (whether it be manual or automated), dirt or by the middle of the impure water (Hayes *et al.*, 2001).

This high rate of milk contamination by exogenous sources (such as milking equipment), was reported by McKinnon *et al.* (1990).

Microorganisms are also found in milk which is considered as an ideal substrate for their development. The presence of many growth factors within this aliment will satisfy many of demanding microbial species, which are so difficult to grow in a less complete media (Guiraud, 1998).

The microorganisms that can enter the milk, can multiply and cause its deterioration and make it dangerous because of potential risks to public health (Chye *et al.*, 2004). Detection of coli form bacteria and other pathogens in milk, we inquired about the possibility of contamination of the milk via the udder, by the milking equipment or via the water used (Bonfoh *et al.*, 2003).

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MATERIALS AND METHODS

In order to get an insight on the microbial quality of milk produced at the point of production (farm level), the milk samples (155 samples of raw milk (n = 155)) were collected from different farms located around the wilaya of Tiaret and examined from the bacterial point of view.

Each sample underwent the following tests after preparing dilutions:

The Enumeration of FAMT (mesophilic Total Aerobic flora)

This count reflects the general microbiological quality of the product. The duration of this period is three days (72 h).

From dilutions 10^{-1} , 10^{-2} , 10^{-3} , we have put aseptically 1 mL of each dilution in an empty and numbered Petri dish (number of sample and dilution):

- Add 15 mL of agar PCA (Plate Count Agar) melted and cooled to $45 \pm 1^\circ\text{C}$. To standardize the inoculums to the agar, we make circular and back and forth movements. Let solidify on the bench and then incubate at 30°C for 72 h

Counting Petri dishes is based on the standard set by legislation.

Search for Fecal Coli Form

Put about 12 cm mid VRBL (Violet Red Bile Lactose Agar) super cooled, then mixed and allow to mass and covered with 4 cm of medium; incubated after within 24 h at 44°C .

All red colonies (lactose +) with a diameter of 0.5 mm minimum, 24 h after, are considered fecal coli form Petri dishes containing between 15 and 150 colony.

Search of *Staphylococcus aureus*

The Baird Parker media is cast in Petri dishes. We introduce 0.1 mL of the inoculums, spread over the entire surface of the Petri dishes. Incubation is made for 24-48 h at 37°C .

Staphylococcus Aureus colonies appear as black in the media; they are shiny, convex and surrounded by a halo of about 2 to 5 mm diameter.

Search for Fecal Streptococci

Introduce aseptically into five tubes of Rothe media, 1 mL of milk and in a series of other tubes, 1 mL of the following dilutions: 1/10, 1/100 and 1/1000. The incubation takes place in an oven at 37°C for 48 h. Each positive tube is transplanted individually (tube with disorder), using a curly loop of inoculation on a Litsky media and placing them after, in an incubator at 37°C for 48 h.

Tubes with a homogeneous disorder and a purple patch at the bottom contain at least one fecal Streptococcus.

RESULTS

The great variability of the contamination of milk samples revealed an alarming situation of the quality of this product. At the hygienic quality, all samples can be classified as bad because they far exceed the standard recommended by the official journal (decree No. 35 JORA, 27 May 1998) on microbiological criteria for milk and milk products.

In present results, we have found that all the samples analyzed did not escape to the fecal or pathological contamination (Table 1).

Table 1: Frequency of microbial contamination of samples

Bacteria	Faecal coli form	Faecal streptococci	<i>Staphylococcus aureus</i>
No. of positive cases	28	125	127
Percentage	18.06	80.64	81.93

Table 2: Rate of contamination of analyzed milk samples

Bacteria	Minimum	Average	Maximum
Faecal coli form	1,1.10 ³	1,7.10	1,3.10 ⁵
<i>Staphylococcus aureus</i>	18	2.10 ²	1,7.10 ³

It should be noted that some samples (n = 127) have not been at all contaminated by coli forms.

In connection with the suspected pathogenic bacteria, 28 of the 155 samples tested showed no contamination by Staphylococci (Table 1).

The average grade for the 127 contaminated samples was 2.10² for Faecal streptococci, since among the 155, 125 samples were positive regarding the latter (Table 2).

Overall the estimates are represented by the Table 2.

DISCUSSION

Highlighting the quality of the milk mixture has allowed us to prove that the product sold on the market or delivered to the industrial processing is highly contaminated. Some samples contained a combination of several bacteria and this has already been reported by Bind *et al.* (1980). All samples do not meet the standard in this area, which means poor hygiene conditions at the farm and especially during milking. Microbiological quality of milk is important for its conservation and even for its transformation (Guinot-Thomas *et al.*, 1995).

Contamination by FAMT is very important because 81.2% of analyzed milks show a higher flora at 10⁵ cfu mL⁻¹. This situation is alarming compared to those reported by Boor *et al.* (1998), or just 5%, of milk farms included flora which exceed (10⁵ CFU mL⁻¹). Baazize (2005) reported contamination of the approximately 91.78% of the analyzed samples.

Contamination of milk by a FAMT > 2.10⁶ cfu mL⁻¹ was reported by:

- Arimi *et al.* (2000) in Kenya, where he observed rates of 86 and 88% in Nairobi and Nakuru, respectively
- Mwangi *et al.* (2000) also at a rate of 82% in the same country

Flora must be less than 10⁵ bacteria mL⁻¹ for processing; however, the milk weakly loaded in total flora has an often poor capacity to cheese transformation.

As the FAMT tells us on overall product quality and the overall level of hygiene, high levels of contamination obtained in our samples are probably the result of poor hygiene of milking or operating of refrigeration tanks.

The presence of fecal flora reflects a very bad behavior of dairy cattle and this is purely the result of a situation of neglect of the simplest rules of hygiene such as: washing the udder before and after milking. Present results (18.06%) for fecal coli forms are similar to those reported by Baazize (2005), of about 17.80%.

The presence of considered pathogenic bacteria is probably due to the poor hygienic containers used in the industry (Ashnafi, 1996; Godefay and Molla, 2000).

Milk contamination becomes a serious problem of public health, especially with the presence of *Staphylococcus Aureus* which is responsible for food poisoning.

The contamination by *Staphylococcus aureus* at a rate of 81.93% of milk is worrying, results that are closer to those reported by Baazize (2005), of about 95%.

This pathogen germ poses an immediate risk to public health in processed products such as may occur in certain conditions, heat-stable enter toxin that can withstand heat treatment.

Contamination of Milk Mixture by *Staphylococcus aureus*

- In a qualitative manner, of about 12, 62 and 93.3% has been reported by Jayarao and Henning (2001), Desmasures *et al.*, (1997) and Adesiyun (1994), respectively
- In a quantitative manner, with a rate of 60% for an average count of 12.10^3 CFU mL⁻¹ has been reported by Chye *et al.* (2004) and 93% for plants less than or equal to 5.10^2 cfu mL⁻¹ and 7% for greater than 5.10^2 cfu mL⁻¹, reported by De Reu *et al.* (2004)
- This significant contamination of milk analyzed is a consequence of mammary infections in livestock. According to Berouel (2003) and Gharbi (2002) *Staphylococcus aureus* is responsible for 50.55 and 77.77%, respectively, of cases of mastitis in dairy cows

The presence of fecal streptococci reflects a problem of contamination of the environment, which has been reported by Dunsmore and Bates (1982) and Kielwein (1982). Present results report 80.64% as the rate of presence of streptococci in milk, Baazize (2005) reported a rate of 91.09%, which seems to be normal as this rate although considerable, only reflects poor hygienic conditions of farms. Enterococci are widespread in the natural environment of the animal, but are not or rarely pathogenic. Thus, they are not among the criteria for raw milk for the other legislation. However, the work of Hamama and Moktafi (1990) has reported an average grade of milk Enterococci of $1.2 \cdot 10^4$ mL⁻¹, even considerable.

Overall, the presence of this diverse flora, of fecal or pathogen origin, is the logical result of poor management of our farmers by veterinarians.

CONCLUSIONS

The evaluation of microbial quality of raw milk produced in the farm k revealed that milk was contaminated. The large variation in microbial contamination of milk, whatever the type of flora seen (fecal contamination or disease) are the basis induced by the poor conditions for breeding and milking. The presence of the organism in milk indicates the poor hygienic practices and health conditions of animal. It is necessary to minimize microbial contamination which can be achieved through healthy animal and milker and hygienic practices followed in dairy plant.

For an effective action, we must establish a policy of milk quality; this requires respect and knowledge of farming conditions, plus a good extension of good husbandry practices, especially related to cleanliness animals and their environment and of course the security conditions for storage and delivery of milk to put in the hands of the consumer, a product of better nutritional value.

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