

Prevalence of subclinical mastitis in dairy cows: a case study of the livestock complex, Tirana (Albania)

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Abstract

This study was carried out in a farm of cow in Ndroq, Tirana (capital of Albania), aiming at the definition of subclinical mastitis in the milk cows, knowing that 70-80% of the total mastitis are of the subclinical form. A total 96 milk samples were collected from 24 cows – half of them in the first 100 days of the lactation period and half at the end of this period (before drying). Analytical results showed an increasing of the somatic cells in the milk, beyond the permitted levels: 430.00-630.00 cells/ml. Bacteriological tests demonstrated the presence of *Staphylococcus aureus* and *Streptococcus agalactiae*. The prevalence of subclinical mastitis in total was 37.68%. It was detected that 20.8% of the total was caused by *Staphylococcus aureus* and 4.2% of the total was caused by *Streptococcus agalactiae*. At the end of the study, it was recommended a package of causes/preventive measures against mastitis in this farm.

Keywords: Prevention Measures, Somatic Cells, *Staphylococcus aureus*, *Streptococcus agalactiae*

Introduction

Mastitis is the most common infectious disease encountered in intensively farmed dairy cattle (Hoblet and Miller, 1999). Bovine mastitis is caused by many infectious agents. Generally they are divided in four groups: contagious mastitis, environmental mastitis, mastitis caused by minor pathogens and uncommon pathogens (Becker, 1994). Mastitis is a disease of major economic importance and the most costly disease in dairy cattle. The economic impact of mastitis involves several components: loss of milk production, discharged milk from cows with clinical mastitis, replacement cost of culled cows, extra labour required for treatment and monitoring, veterinary services for treatment and control program. Overall economic losses due to mastitis in the USA are estimated to be approximately 185 \$ per cow annually. The total annual cost of mastitis in the dairy cattle population is estimated to be 10% of the total value of farm milk sales, and about two third of this loss is due to reduced milk production in sub clinically affected cows (Hoblet and Miller, 1999). In addition, there are more cost factors such as antimicrobial residues in milk from treated cows and other aspects of food safety.

Mastitis has a serious zoonotic potential associated with shedding of bacteria and their toxins in the milk. Milk originated from affected cows can serve as source

of dangerous bacteria: *Mycobacterium bovis*, *Streptococcus agalactiae*, *Staphylococcus aureus*, *Listeria monocitogenes*, *Salmonella spp*, *Campylobacteria spp*, *Eschericia.coli* etc. (Gonzalez and Wilson, 2003). The most prevalent bacteria isolated from mastitis are *Streptococcus agalactiae*, *Staphylococcus aureus*, *Eschericia coli* and *Streptococcus uberis*. Despite the claim of some authors that implementation of control programmes, the incidence of contagious mastitis caused by *Staphylococcus aureus* and *Streptococcus agalactiae* has declined (Sol et al., 2000), infection with *Staphylococcus aureus* remains a common cause of clinical and subclinical mastitis in many modern dairy herds. Many studies have proved that strain types derived from udder are different from strains isolated from other sites of the body. The mechanism of tissue invasion includes virulence factors such as hyaluronidase, staphylocinase, haemolysins and proteinases. The capsule protects the agent from phagocytosis and *Staphylococcus aureus* can survive and multiply inside of phagocytes (Roberson et al., 1994).

Staphylococcus aureus may cause mastitis which ranges in severity from per acute to subclinical. Nowadays, the most common observed form is chronic subclinical disease interspersed with periodic clinical episodes. Severe disease usually develops in early lactation. The most severe form caused

by *Staphylococcus aureus* is named as per acute gangrenous mastitis which can be developed into toxemia. Subclinical and chronic cases have high importance in terms of source and reservoir of infection (Wilson et al., 1997).

Mastitis caused by *Streptococcus agalactiae* is less frequently, although it continues to be an important problem in individual herds with poor hygiene condition (Naive, et al. 1989). The course of disease is similar to that of chronic *Staphylococcus aureus* infection with high somatic cell counts (SCC) (Wilson et al., 1997). The clinical cases tend to be mild systemic reactions and confined to the mammary gland. When the inflammation of acini and ducts begins to resolve, the epithelial lining is shed, contributing to clot formation in the milk.

The aim of this paper is to emphasize the importance of bovine subclinical mastitis, to isolate the most prevalent bacteria and to encourage implementation of control programs in Albanian dairy herds.

Materials and Methods

This study was undertaken in a dairy farm production in Ndroq-Tirana. The farm was established in 2007 and has a total of 62 dairy cows. They belong to three different breeds: 12 Holstein, 15 Jersey and 35 Brunalpina. The study was carried out analyzing randomly 96 samples of milk, belonging to 24 cows. 48 random samples were taken during the first 100 days of lactation period and equal number of samples in the last period of lactation, before drying. All 24 tested cows were not treated with antibiotics in the last two months and all their teats quarters were healthy.

Milk samples were collected and transported according to standard techniques and preserved in freezing conditions until their analysis (Piccinini et al., 2003). The milk samples were analyzed for total somatic cell count according to the method described by Piccinini et al. (2003). Every sample was taken equally from every teat of the cow: two teats on the left and two others on the right.

Counting of total somatic cells was performed through the use of defined kits, placed in an electronic automatic equipment of De Laval production. Samples were put into kits which were put in the electronic counter equipment, where the total somatic cells were counted automatically.

Milk samples were also analyzed for neutrophils percentage (Roberson et al., 1994). Microbiological bacterial examination was performed for *Staphylococcus aureus* and *Staphylococcus agalactea* (Larsen et al., 2002). Chemical and physical analyses of the raw milk were also determined (Radostits et al., 1994).

Results and Discussion

Results of total somatic cells number for the 96 samples analyzed are shown in table 1. In this way, it can be identified more clearly which of the teats has possible problems related with mastitis presence. Results of neutrophils percentage for each cow tested teat are shown in table 2. Table 3 shows the percentage of milk sample polluted with *Staphylococcus aureus* and *Streptococcus agalactiae* respectively. Table 4 shows some average chemical parameters measured in the raw milk of this farm.

Milk from mastitis infected cows generally contains a high number of somatic cells as well as a high bacterial count. For this reason, the counting of the somatic cells is considered as an adequate mean to discover the presence of mastitis in the cows (Larsen et al., 2002). In this study, the tested samples have a total somatic cells count above the normal value. This content ranges from 430.00 to 630.00 cells/ml (Table1). Cell count in the non-infected lactating mammary gland is usually less than 100.00 somatic cells/ml. According to contemporary studies (Zecconi et al., 2003), this fact testifies the presence of subclinical mastitis in the farm. Neutrophils are a granulocitary fraction of the white blood cells, which play a very important role in the defence system of the organism. In the milk mastitis

Table 1: Total somatic cells count (SCC) in milk samples

No. of samples	Number of somatic cells from every cow teat tested x 10 ³			
	First left	Second left	First Right	Second Right
1	254	150	742*	195
2	150	25	196	675*
3	235	723*	485*	743*
4	185	380	30	350
5	640*	660*	750*	730*
6	480	22	318	20
7	28	31	15	125
8	650**	27	710**	628**
9	350	280	330	310
10	8	12	230	21
11	690**	610**	210	120
12	25	12	9	9
13	470*	31	240	510*
14	12	9	6,5	10
15	675*	460*	210	230
16	22	270	290	12
17	690	280	22	12
18	38	310	160	590
19	11	675*	670*	590*
20	12	150	75	221
21	500	500	500	500
22	13	550*	610*	523*
23	7	5, 5	3,8	4, 5
24	450*	11, 5	40	429*

Note 1: **Staphylococcus aureus* 2: ***Streptococcus agalactiae*

Table 2: Neutrophils content (%) in milk samples

No. of samples	Neutrophils content (%)			
	First left	Second left	First Right	Second right
1	15.9	9	80*	31.5
2	12	12	44	33.3*
3	76	82*	78*	69*
4	21	21	10	14.5
5	68*	55*	50*	59*
6	29	7	7	0
7	3	6	0	12
8	51**	2	39**	68**
9	22	20	24	24
10	0	2	11	6
11	2.3**	30**	0	0
12	2.3	0	0	0
13	23*	2	15.5	17*
14	2	3.1	1.8	7.5
15	13*	14.5*	14.8	11
16	7	13.5	11	2
17	65	11	3	3.1
18	14	12.7	10.1	14
19	0	39.5*	67*	56*
20	6	8.3	6.1	5.9
21	98	98	98	98
22	5.8	68*	3*	48*
23	1.1	2.1	1.7	19
24	21.9*	2.6	19.2	18*

Note 1: **Staphylococcus aureus* 2: ***Streptococcus agalactie*

Table 3: Microbiological results of milk samples

Type of Micro organisms	Positive samples	%	Negative samples	%
<i>Staphylococcus aureus</i>	21	21.8	75	78.2
<i>Streptococcus agalactie</i>	5	5.2	91	94.8

Table 4: Analyses of milk composition

Parameters	Average results
Acidity	20 Thornier
Fat	4.1 5%
Total protein	3.8 %
Lactose	4.7 %
Ash	0. 8 %

infected cows, neutrophils are multiplied considerably (Roberson et al., 1994). As it is shown in Table 2, there is a significantly increasing of their number in subclinical mastitis cases. This happens because neutrophils are the principal cells involved in the elimination of bacteria from mammary gland. Recruitment of neutrophils from the blood to the site of infection, responds to a number of inflammatory mediators such as cytokines and prostaglandins which are the first steps in the inflammatory response. Increased cell number in milk within hours of infection with counts of several hundred cells per ml is common in subclinical infections (Quinn et al., 2002). Our findings are in accordance with other studies (Zecconi et al., 2006).

The present results showed the most frequently two types of pathogen microorganisms: *Staphylococcus aureus* and *Streptococcus agalactie* (Table 1) which are the main contagious bacterial pathogens, with significant impact on milk quality (Gonzalez et al., 2003).

In total, the prevalence in subclinical mastitis was 37.68% of the total cows analyzed. Our results showed out of 96 samples, *Staphylococcus aureus* was responsible for 21 cases of subclinical mastitis and *Streptococcus agalactie* for 5 cases. So, 20.8% of total cases were caused by *Staphylococcus aureus* and 4.2% of total cases were caused by *Streptococcus agalactie* (Table 3). *Staphylococcus aureus* is one of most frequent causes of mastitis and often it causes more than 50% of subclinical infection in a dairy herd. The type of mastitis produced by *Staphylococcus aureus* ranges from subclinical to peracute life-threatening form, one of which is gangrenous mastitis, caused by *Staphylococcus aureus* leads to a gradual replacement of secretory tissue with fibrous tissue and subsequent loss of milk production. *Streptococcus agalactie* resides in the milk and on the surfaces of the milk channels, but does not invade the tissue. There is rapid multiplication of this bacteria with a great outpouring of neutrophils into the ducts with damage to the ductal and acinar epithelium. Both these mastitis respond poorly to antibiotics, because of the development of the tissue barrier that prevents penetration of antibiotics to the site of infection (Quinn et al., 1994).

Analytical results showed an increasing value of total acidity of milk (20 Thornier) towards the normal value of 18 Thornier. This fact is strictly connected and caused by the presence of subclinical mastitis in cows (Fox et al., 2003).

The results of this study showed that subclinical mastitis is a serious threat for the cows on this farm. Prevalence of subclinical mastitis was higher than the developed countries (Piccinini et al., 2003), where rigorous control on subclinical mastitis is applied (Zecconi, et al., 2006).

Conclusions

1. High prevalence of subclinical mastitis caused by *Staphylococcus aureus* and *Streptococcus agalactie* is favoured by a number of factors:

- Unqualified stall workers;
- Hygienic and technical conditions of milking machinery were not at the right level;
- Desinfections of cow tits and selection of the right disinfectant are not performed according to the standard procedure;
- No application of medicaments;

2. Despite the fact that the farm we have studied our study is listed among the best selected and modern farms in Albania, we have observed that there wasn't

applied any contemporary control package for prevention of mastitis in dairy herds.

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