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Research Paper

Effectiveness of some sanitary measures on the survival of mastitis: The point on pre and post soak

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Abstract

The current work aimedto evaluate and update theknowledge concerning the fight against mastitis as well as the efficiency of certain previously used measures like the dipping of the teats before and after milking the cows.For this, we chose two farms to be the subject our clinical tests,the two farms were almostidentical in terms of their animal husbandry practices, except when it comes to the dipping: the first farm applied it in a systematic way while the second did not apply any dipping. With the aim of comparing the incidence rate of mastitis in both farms, first we performed a filling in a questionnaire,thenwe ran the following tests on the animals of both farms: Clinical examination to diagnose the clinical form mastitis, CMT (California Mastitis Test) to detect the subclinical form of mastitis, then we took samples for the bacteriological analysis. The obtained results have shown a significant difference in the prevalence of mastitis between the two farms where only one factor varied. The systemic application of the teat dipping before and after the milking is probably the key factor in reducing teats contamination in farm 1.

Key Words:*Bacteriology, Mastitis, Soaking, Cow.*

1. Introduction

Mastitis, or inflammation of the mammary glands, is considered to be the most common and costly disease affecting dairy cattle across the globe (Hillerton and Kliem 2002). In dairy herds, Mastitis' control is much better achieved by prevention rather than treating.One of the most efficient prevention measures against mastitis is teat dipping, before and after the milking of the animals, its easy implementation, reduced casts as well as its efficiency make teat dipping an ineluctable preventing measure.

Due to its systematic application mastitis incidence rate has dropped by more than 50%, however, is this effect still present? Or is there any resistance lowering the effectiveness of this prevention measure in the control of mastitis?

Despite the feasibility of in-vitro tests, clinical and field trails remain more efficient, because they offer a better accounting for the different aspects of the animal's life.

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The product ability to reduce the rate of mastitis infection within a heard is considered the key criterion of its field efficacy.

In both the United States and Europe many protocols have been outlined and validated, however, we must point out the lack of solid, recent and reliable references on the subject.

Given this situation, in this chapter and in order to update the data on this subject, we aim to demonstrate how effective teat dipping is as a preventive measure against mastitis.

For this, we performed a comparative study between two cattle farms, in one farm teat dipping was carried out in a systemic way (trial farm), in the other farm no dipping was applied (witness farm). Then we compared the mastitis incidence rate in both farms.

2. Material and Methods

2.1. Material

2.1.1. Animals and farms

We chose two farms which had similar characteristics except for a few points, especially the ones related to the milking. Before and after the milking, the first farm utilizes an antiseptic product to apply teat dipping, where the second farm didn't apply any teat dipping. With the aim of evaluating the importance of this process in mastitis control we compared the prevalence rate of mastitis in both farms.

2.1.2. Characteristics of the selected farms

1st Farm

There are 23 cows with 15 of them being dairy Holstein breed. Each cow produces 16 liters per day, of the 15 cows, 13 are in middle of "lactation" while the rest are "dried off".

The cows are housed in a livestock building with an area of 400 m²; they are in free stalling with "head locks" system, sleeping on a bit dirty straw litter.

Feeders are clean, and at a proper height, away from fecal contamination sources and litter.The drinkers are of the automatic type. The exercise area is estimated to have a surface of 1 hectare.

Oat fodder, straw and concentrate feed (bran, corn, MVS:Mineral-vitamin supplement) represent the animal feed.

While fodder is always available for the animals, the concentrate feed is distributed twice a day after the milking is completed, 5kg in the morning and 5kg in the evening regardless of the cow's potential or lactation phase.

Before the milking the teats are dipped in an antiseptic solution, then the milking is realized through amilking machine cart, and after the milking process is done, the teats are dipped again in the antiseptic solution.

2nd Farm

With a total surface area of four hectares, the second farm is engaged in dairy cattle breeding.

This farm contains 18 cows with 12 of them being dairy Holstein breed and each cow produces 16 liters of milk per day, 11 cows are in the middle of lactation and one is dried-off.

The cows are housed in a livestock building with an area of 300 m², they are in free stalling with an exercise area of an estimated surface of 600m², the litter is made of concrete that is slightly dirty and water is distributed in collective waterers.

In this farm the animal feed is based on Oat fodder, straw, wheat bran, barley and concentrate feed. Each cow's daily feed intake consists of Oat fodder and concentrate feed (bran, corn, MVS:Mineral-vitamin supplement) and fodder is always available and at will for the animals.

The concentrate feed is distributed twice a day before the milking process, 6kg in the morning and 6kg in the evening and with no distinction between cows at different physiological stages, production potential, ages or health status.

Other characteristics of the farms 1 and 2

Table 1 summarizes the results of the survey conducted on the two farms, outlining the different animal husbandrypractices, particularly ones related to the milking and mastitis prevention and control.

Table 1: Survey conducted on the two farms, outlining the different animal husbandry practices

	1st Farm	2nd Farm
Milking process type	Manual	Manual
Hand washing	Yes	Yes
Teats washing	No	Yes
Product nature	None	Water
Teat dipping before milking	Yes	No
Teat dipping after milking	Yes	No
Dried-off cows	Yes	Yes
Dry-off period length	A month and a half	2 months
Separation of dried-off cows	No	No
Application of a preventive treatment at the moment of the drying up	No	No

2.1.3. Materials used for the clinical examination, screening, milk sampling and bacteriological analysis

- Two questionnaires, one for the breeders and another for the animals
- Disposable gloves
- Disposable sponge dishcloths
- Thermometer and stethoscope
- Digital camera, to capture the different event happening in the herds
- Proper Apron and boots
- Cleaning materials (Brush, Bucket, aseptic product) used at the start and end of the visit
- A bucket for hand washing
- The CMT with its cup
- Black Background Bowl
- Aseptic solution (Bleach, KMnO4)
- Cotton
- Alcohol 70%
- Sterile Compress
- A 30ml sterile tube
- Isotherm Cooler
- Culturing mediums for isolating samples and mastitis causing germs identifying [supplement B].

2.2. Methodology used in the farms

We based our study on the determination of the prevalence rate of mastitis in the two farms as well as comparing between the two rates observed, for this we paid the two farms visits that were unannounced with the aim to know the reality of the animal husbandry practices.

During these visits, we focused our study on the management of the different animal husbandry practices, and we paid special attention to the general conditions of the lactating cows, their feed, the barn's hygiene, accommodation conditions and the milking technic and hygiene.

In order to collect the needed information which could represent a risk factor, we started by running a questionnaire on both farms (supplement information A). with the aim of diagnosing the clinical form of mastitis we carried out a general clinical examination followed by a special examination of the mammary glands of each lactating cow that were present the day of the visit, Followed by a CMT based screening to diagnose the subclinical form, the screening was done according to the method described byDurocher and Roy (2008) by analyzing the milk from the whole mammary area, with scores ranging from 0 to 4. A animal is considered positive if it has a score superior or equal to 1,and to confirm the results obtained by the CMT each positive animal gets a bacteriological analysis to confirm it's positivity.

2.2.1. Sampling and bacteriological analysis technics

We took the milk samples needed for the study before the evening's milking session, between 4 and 6 pm. We took additional samples from the animals that had a positive response to the CMT.

To ensure getting honest and authentic results, we followed with great attention the asepsis and antisepsis rules while taking the needed samples.

The bacteriological analysis of the samples was carried out according to the method described by QUINN et al. (2002).

2.3. Statisticalanalysis

2.3.1. Descriptive statistic

The aim of the descriptive statistic is to represent data which main characteristics quantifying their variability are to be known.

The data for our study was represented by Excel 2007® software, from Microsoft Office 2007®

2.3.2. Analyticalstatistic

The analytical statistic was performed using statistical software: Statistica 7.0 ®, from Statsoft®, using the following tests:

-Homogeneity test 1 (Comparison between two measures): allows us to compare between the measures obtained from the two farms.

- Homogeneity test 2 (Comparison between observed and academical measures): allows us to compare between the measures we recorded to those recorded in other works by other researchers.

3. Results

3.1. Clinical mastitis rate

In our study,and after the clinical examination none of the cows of both farms represented any sine of the clinical form of mastitis, in addition the macroscopic aspect of the milk seems to be normal, this means that the samples are taken from clinically healthy cows.

3.2. Subclinical mastitis rate [SCM]

The CMT based subclinical mastitis detection as revealed the presence of a type of mastitis, with variable frequencies in the two farms (Table 2).

Table 2: CMT based subclinical mastitis detection in both farms

Farms	Tested animals	Tested teats	Positive cows [%]	Positive teats [%]
1	13	52	2 [15,38]	7[13,46]
2	11	44	6[54]	20[45]

1st Farm

Our CMT based detection test revealed that 15.38% of the cowshad SCM. And when it came to the teats 13.46% were infected.

2nd Farm

At the day of the visit, 6 cows out of the 11 had a CMT score equal or superior to 1. Furthermore, from the 54 tested teats 20 were CMT positive.

The comparison between the two observed frequencies revealed a significance difference [p<0,05] regardless of the scale.

3.3. Bacteriological analysis results

The bacteriological diagnosis plays a critical role in the diagnosis of mastitis, it is the reference method in the diagnosis. The aim of the milk samples bacteriological diagnosis is to confirm the presence of real infection within the CMT positive teats. Also, we run the bacteriological diagnosis to compare on an individual as well as teat level mastitis' prevalence rate between the two farms. The results of the diagnosis and the pathogen are represented in Table 3.

Table 3: Bacteriological diagnosis results for both farms

Farms	Sample Animals	Sample Teats	Positive animals [%]	Positive Teats [%]
1	2	7	2 [100]	6 [85,71]
2	6	20	6 [100]	16 [80]

The bacteriological analysis done on the CMT positive samples has shown great accuracy and strong reliability of the CMT in the diagnosis of mastitis. Indeed 100% of the CMT positive animals were revealed through the bacteriological analysis to have a real infection.

On teats level and in both farm the bacteriological analysis revealed that the CMT had an accuracy rate of 80%.

4.Discussion

In our study, the clinical examination revealed an absence of the clinical form of mastitis in both farms, however other different results were obtained by other studies, in one such study that was carried out on 4 Algerian farms, the clinical diagnosis revealed that 15.1% of the cows presented the clinical form of mastitis (Bouzid ET AL, 2011).

The prevalence rate of clinical mastitis obtained by our study (0%) was inferior to what other Algerian studies have obtained namely BOUAZIZ et al. (2000) (32.6%) and NIAR et al. (2000) (42.2), and it also was inferior to what a French study ranPOUTREL (1985) has obtained (31,7%). The application of symptomatic treatments for the clinical form of mastitis in addition to improving the hygiene conditions may partially explain this difference.

The approach applied in our study could be the reason for the absence of clinical mastitis in both farms: a cross-sectional rather than a longitudinal study could lower the chances of having mastitis.

The subclinical mastitis screening revealed a prevalence rate of 15.38% for the first farm and 54% for the second. On the same subject other studies have shown differences in the prevalence rates. In some farms in the eastern Algeria the CMT has shown that the prevalence rate of SCM was 29,7%(Bouzid et al, 2011).For comparison, a study by AGGAD et al. (2009) on evaluating the hygienic quality of milk in western Algeria has shown that the subclinical form of mastitis was detected in 76% of mixed milk and in 47% of individual milk.

The difference in the prevalence rate of SCM between the two farms was significant ($p \leq 0,05$) despite that the two farms were similar in terms of the barn's general hygiene and the milking progress. We believe that the teat dipping before and after the milking process was the main cause of the difference in the prevalence rates. This is backed by the fact that the effectiveness of this preventive measure was proven by other studies (Pankey 1989; Schreiner and Rueg 2003).

Even with the application of control measures mastitis still prevailed in both farms, this confirms once more that this disease cannot be completely eradicated; however, it can be controlled by reducing the exposure of animals to sources of microorganisms responsible of the infection and by strengthening the defense mechanisms of the animals (Smith et al. 1985).

The systematic application of teat dipping before and after the milking in the first farm was probably a key factor in reducing the mammary glands contamination.

Pankey (1989) indicated that in case the teats are no correctly cleaned and sterilized the infection risk (milk contamination) increased considerably. It is stated that the gland's infection rate is highly related to the number of microorganism agents present at the teat's end (Schreiner and Rueg 2003). This means if the dipping is applied in a systematic way (Farm 1) the pathogens are eliminated and the infection rate is reduced considerably.

The aim of the dipping after the milking process is first to use antiseptic agents to rapidly eliminate the pathogens coming from the milking machine before they colonize the mammary gland. The second objective is to use adjuvant agents to rehydrate the outer layer of the epiderma to give back the skin it's elastic and resistance qualities.

It is important to note that mastitis nature makes it a multifactorial disease and is the result of interaction of various inner and outer factors and because of that it is hard to evaluate the effectiveness of a control measure in the prevalence of mastitis.

Regardless of the fact that in Algeria no study has been done on the effectiveness of teat dipping in mastitis control, we have found that the cows from the farm where no dipping is applied were more sensible toward mammary infections in comparison to the cows of the farm that applied the dipping.

Conclusion

Mastitis by its nature is a very complex disease that can emerge in a direct or indirect form (clinical and subclinical). This disease is present with variable prevalence rates in our farms and despite being the cause of numerous economic losses it is underestimated. We evaluated the measures used in the two farms to control mastitis, and by comparing the disease's prevalence ratebetween the two farms we found a significant difference in the prevalence from farm to farm where only one factor varied.It is important to mentiondue mastitis' nature, being a very complex and multifactorial disease, it is hard to evaluate and qualify how efficient a measure is in the control of mastitis.

A More detailed long going study concerning every measure and risk factor is needed, to enable us to evaluate the effect of every measure on the prevalence of the disease bearing in mind the effects of the weather, the animal's physiological condition and other factors that could interfere with the outlining of mastitis.

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