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Harm to the Well-being of the Udder at the Level of Dairy Farms of Sidi Mhamed Benali Wilaya of Relizane (Algeria)

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ABSTRACT

Background: Among the dairy cattle production problems in Algeria, mastitis rank first in terms of socio-economic impact. Our aim is to identify the state of well-being of the udder in order to manage and control mastitis related problems.

Methods: The pH analysis of 177 cow milk samples was performed at two farms located in the Sidi Mhamed Benali region in northwest Algeria associated with an assessment (of the udder's cleanliness degree, the udder's position, the teat's hyperkeratosis lesion and the ITH) out over a period of one year (2020-2021).

Result: Analysis of mean (of cleanliness, udder position and ITH) between cold and warm season were significantly different at a value of [(4.11; 2.75); (5.19; 4.11); (56.96; 73.76)] respectively. The paper test revealed that the health of the udder is influenced by any variation in cleanliness and the ITH whose correlation coefficient is equal to 0.72 leading to the appearance of subclinical mastitis during the cold season. While during the hot season the bad milking procedure is incriminated in the appearance of hyperkeratosis lesion at a mean value equal to 1 (smooth ring stage) inducing the appearance of clinical mastitis with $p<0.05$, moreover the cows in first lactation are the most influenced by these elicited factors. In conclusion, monitoring and evaluating the well-being of the udder around the parturition is a tool that allows better prevention of mastitis.

Key words: Animal welfare, Audit, Dairy cattle, Mastitis.

INTRODUCTION

Dairy production in Algeria corresponds, in 2016, to 5.9% of world milk production, it is unsuited to the needs of the Algerian population. This difficulty was triggered by the population explosion has been amplified by the exorbitant cost of importing powdered milk at a very high bill (Sraïri *et al.* 2019).

Several factors have been identified as the cause of this low production: food (Commun *et al.* 2014), environment (Graves 2003; Rouissi *et al.* 2018; Narmilan *et al.* 2021), health status (Kaouche *et al*. 2012; Khaleel Ulla *et al.* 2021), behavior (Cazin *et al.* 2014) and the psychological state of the animal (Darej *et al*. 2019), Thus, the productivity of the dairy cow is dependent on animal welfare.

Respect for animal welfare enables sustainable and respectful agriculture and this respect not only increases milk production but also improves its quality.

Animal welfare in Algeria does not occupy an important place. Most of the work carried out so far is mainly concerned with animal performance, feeding management and reproduction management, on the other hand, little work was devoted to the welfare of the animal and more specifically to the welfare of the udder and it is in this perspective that the present work fits.

MATERIALS AND METHODS

Our study was carried out at the level of two Dairy Farms Located in Sidi Mhamed Benali a district of Relizane Province, Algeria. This zone is characterized by the greatter population of livestock and the presence of mini-dairy. 177 breast tests were performed during the month of July 2020 and until the month of May 2021 on Prim Holstein and Montbéliard cows aged between (2nd lactation and 3rd lactation). These tests were performed at different lactation stages (from the first month to the third month) of lactation.

A hygienic check and a full udder sanitary check were carried out at the same time, before milking, based on a scoring grid for the sanitary state of teat established by Gourreau *et al.* (1995) and on a scoring grid for hygienic state according to the model of Lensink *et al.* (2012), cows having a score 1 are considered "very clean" while those with a score of 5 are considered "very dirty".

Regarding the location of the udder, we have looked at the udder's floor position relative to the point of hock, depending on this position, a score is given based on a scale established by Lajudi *et al.* (2014).

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The pH of milk was determined at the time of milking with pH indicator paper (bromothymol paper). This test consists of placing a few drops of milk on the indicator paper, after removing the first jets. After 15 to 20 seconds of contact, the color change from yellow to green, or blue was considered to be from an infected udder (positive sample). The temperature and humidity of livestock building were taken using an electronic thermometer (HTC1, China). The temperature humidity index is calculated according to the following formula (Nienaber *et al.* 1999):

$$ITH = 0.8\,Ta + HR\,(Ta - 14.4) + 46.4$$

Where,
ITH = Temperature humidity index.
Ta = Ambient temperature in °C.
RH = Relative air humidity.

All statistical analysis were performed with the "statistica" program, by applying the Student test (comparison of two means) and calculating the correlation coefficient.

RESULTS AND DISCUSSION

Kaouche-Adjlane *et al.* (2020) found that 45% of the samples came from infected udders, effectivelly our results also showed a rate of 53.67% mastitis. Infected udder is a multifactorial disease caused by (milking, nutritional factors, intercurrent pathology (delayed uterine involution) and also they are part of production diseases (Bouhroum and Bensahli, 2016). We can distinguish two types of clinical and subclinical mastitis. Clinical mastitis is characterized by a change in the macroscopic appearance of milk, whether it is a change in its color or consistency, or both. These symptoms can be associated with local symptoms such as inflammation of udder and even damage to the general condition in more severe cases (Shyaka *et al.* 2010)

Subclinical mastitis, on the other hand, is asymptomatic. The secretion appears macroscopically normal. Only the examination of the milk by specific techniques and tests makes it possible to highlight chemical, bacteriological and above all cellular modifications in the milk (Boufaida Asnoune *et al.* 2012).

Season effect

It was observed in Table 1 that the causes influencing the appearance of subclinical mastitis during the cold season were the low position of the mammary gland (5.19), uncleanness of the udder (4.11) and low ITH (56.96). While in the hot season the factor influencing the onset of clinical mastitis was the hyperkeratosis lesion (1) with $p<0.05$. It was also observed from Table 2 that there was a significant correlation (0.72) between the temperature humidity index and the degree of udder's cleanliness.

The risk of subclinical mastitis was appeared during the cold season. This can be explained by the udder position. According to Hamed and M'sadak (2016), when the proportion of cows with a low udder is greater than 25%, the situation is considered to be at risk, cows with udder too low, they are more exposed lesions and dirt.

The udder cleanliness rating can then be a relevant indicator. Indeed the results on the udder's cleanliness showed that the infected udders were very dirty. The pollution of the udder depends on the quality of bedding and the atmosphere in the building. The purpose of bedding is to absorb moisture, while also improving animal comfort (Cazin *et al.* 2014). In addition, the number of germs is high on a sleeping area without bedding compared to those with bedding, acording to Kristula *et al.* (2008) they observed bacterial populations grew steadily on mattresses and were generally higher at 36 to 48 hours than at 12 to 24 hours. Therefore, rugged terrain exposes cows to various trauma and overcontamination of udder by dirt (Cazin *et al.* 2014) and an intensification of the proliferation of germs in the environment (Mtaallah *et al.* 2002), indeed we noted a total absence of litter at the level the livestock building.

The renewal of air is important to evacuate the water vapor emanating from the respiration of animals and the evaporation of humidity from the environment as well as ammonia, carbon dioxide, dust and infectious agents (Ferre, 2003). The livestock building of our experimentation had a

Table 1: Comparison factors (teat lesion, mammary line, cleanliness and ITH) between the hot and cold seasons in cows with mastitis.

	Cold season	Hot season
	Subclinical mastitis	Clinical mastitis
Cow	M=1.21*	M=1.41*
	N=52	N=43
	Std=0.41	Std=0.49
Lesion	M=0.80	M=1*
	N=52	N=43
	Std=0.52	Std=0.37
Mammary line	M=5.19*	M=4.11
	N=52	N=43
	Std=2.06	Std=1.60
Udder cleanliness	M=4.11*	M=2.75
	N=52	N=43
	Std=1.13	Std=1.49
ITH	M=56.96*	M=73.76
	N=52	N=43
	Std=9.34	Std=6.67

*Significant $p<0.05$, M= Mean, N= Effective, Std= Standard deviation.

Table 2: Correlation between lesion, position of the mammary gland, ITH and udder cleanliness.

Variable	The correlations are significant $p<0.05$			
	Var 1	Var 2	Var 3	Var 4
Var 1	1.00	0.09	0.11	0.08
Var 2	0.09	1.00	-0.01	-0.05
Var 3	0.11	-0.01	1.00	0.72
Var 4	0.08	-0.05	0.72	1.00

Var 1= Lesion; Var 2= Position of the mammary gland; Var 3= Udder cleanliness; Var 4= ITH.

Table 3: Comparison factors (teat lesion, mammary line, cleanliness and ITH) between first lactation cows and second lactation cows during both seasons.

	Cold season		Hot season	
Cow	First month of lactation	Second month of lactation	First month of lactation	Second month of lactation
Lesion	M=1.07*	M=0.71	M=0.77	M=0.50
	N=28	N=7	N=9	N=4
	Std=0.37	Std=0.48	Std=0.66	Std=0.57
Mammary line	M=4.60*	M=2.85	M=6.11*	M=3
	N=28	N=7	N=9	N=4
	Std=1.39	Std=1.46	Std=1.45	Std=1.63
Udder cleanliness	M=4.75*	M=3.57	M=3.11	M=3.00
	N=28	N=7	N=9	N=4
	Std=0.75	Std=0.97	Std=0.60	Std=1.41
ITH	M=51.05*	M=63.10	M=68.54	M=75.94
	N=28	N=7	N=9	N=4
	Std=6.84	Std=9.82	Std=7.13	Std=7.63

*Significant p<0.05, M= Mean, N= Effective, Std= Standard deviation.

poor aeration which does not allow good control of the atmosphere, where we noted a high average humidity to a value of (84%) during the cold season, moreover our results showed that 'there is a positive correlation (0.72) between the ITH and the degree of cleanliness of the udder. Therefore the higher the humidity, the dirtier the animals and the more bacteria from the environment multiply intensely (Menard *et al*. 2002).

Regarding the risk of clinical mastitis, it appears according to our results during the hot season and it is higher when the lesions are located at the end of teat. These can be caused by the milking machine, according to M'sadak and Hamed, (2016), they found that the vacuum level, the frequency of pulsation and the pulsation ratio with a rate 59%, 45% and 23% respectively are inadequate to the standards, which leads to teat's lesion. Effectively it was noticed that the breeders were not changing the muff of the milking machine every year, according to Haj Mbarek and M'Sadak, (2015) and M'Sadak *et al*. (2012), the control of the milking machine is necessary in order to avoid lesions of teat and hence mastitis. Hyperkeratosis can be seen also as the result of poor environment (Gerault, 2014; Bouraoui *et al*. 2014; Kebbal *et al*. 2020). Some authors have noticed that during the hot season the resting behavior changes in cows or the time spent lying down decreases, in order to increase the heat exchange capacities between the animal's body and the external environment (losses by radiation), (Bonnefoy and Noordhuizen, 2011). This eliminates the second environmental cause in the development of hyperkeratosis lesions and thus blames the wrong milking procedure.

Effect of lactation stage

It was observed in the Table 3 that cows in the first month of lactation are the most influenced by the factors already aroused (teat lesion, mammary position, cleanliness of udder and ITH) than cows in the second month of lactation at a value average of [(1.07, 0.71); (4.60, 2.85); (4.75, 3.75); (51.05, 63.10) respectively with p<0.05.

This is explained by the immunity deficit around the peripartum (Meglia *et al.* 2005; Rinaldi *et al.* 2008; Herr *et al.* 2011) who is fundamentally involved in the etiology of the onset of mastitis. The udder is more sensitive to environmental germs during this period. Contamination occurs through direct contact with entry of bacteria through the teat canal when the ostium is not properly closed or damaged (Seegers *et al.* 2013).

Conclusion

This work has confirmed the direct impact of non-compliance with the well-being of the udder on the quality of the milk. Udder wellness assessment techniques and regular monitoring of udder health can help reduce infectious mastitis in dairy flocks and can help breeder to make better decisions about how to prevent it (proper hygiene during milking, correct mammary gland conformation, good housing design, bedding and resting air ....) and to consider adequate treatment strategies.

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