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Milking Practice and Risk Factors for Bovine Mastitis

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Abstract

IN ALGERIA, simple omissions in the milking routine, such as the absence of teat post-dipping, increase the risk of deteriorating udder health at the herd level. To identify these critical control points, we conducted a case-control study on 27 dairy farms in the North of Algeria, whose health status was established by longitudinal monitoring of bulk tank milk (California Mastitis Test). The analysis revealed that three practices were significantly associated with problematic status: failure to eliminate foremilk (OR = 5.4), omission of teat pre- and post-dipping (OR = 4.9), and inadequate teat drying (OR = 4.9). These results, contextualized by a cross-sectional survey showing widespread hygiene deficiencies, demonstrate that specific and modifiable failures are the main levers for improvement. We conclude that the risk of mastitis at herd level in the Ouaguenoun region is mainly determined by the omission of simple, but critical, hygiene gestures during milking. By prioritizing the risk factors, our analysis revealed three preponderant control points: non-elimination of first sprays, absence of teat disinfection and inadequate udder drying.

Keywords: Cows, mastitis, milking, practice, risk factors.

Introduction

Bovine dairy production is a strategic pillar of food security and socio-economic development in Algeria. Faced with a steadily growing national demand for dairy products [1], estimated at over five billion liters per year, the local industry is striving to increase productivity in order to reduce dependence on milk powder imports, which still meet almost 40% of requirements [2], a situation of dependence that persists according to recent international analyses [3] (FAO, 2023). However, the achievement of this objective is hampered by multiple zootechnical and sanitary constraints, including bovine mastitis.

Mastitis is the most frequent and costly pathology in dairy farming worldwide [4]. Recent economic evaluations confirm this status, estimating its global cost at several tens of billions of dollars annually [5]. In Algeria, their economic impact is considerable, estimated at several hundred million dollars annually, due to the direct and indirect losses they generate (equivalent to a financial loss between 18450.52 and 26219.16 million Algerian Dinar or 230.6 and 327.7 million US dollars; 1 US $ = 80 AD) [6]. These losses include a significant reduction in milk production, a deterioration in the physico-chemical and nutritional quality of the milk, and an alteration in its hygienic quality due to an increase in bacterial load and somatic cell count (SCC) [7]. A high SCC is not only an indicator of intramammary infection, but also negatively affects cheese processing yields and the shelf life of dairy products [8], deleterious effects on coagulation and yields that are continually confirmed by current research into milk proteomics [9].

Literature has amply demonstrated that the control of mammary infections is based on a multifactorial surveillance program, within which hygiene practices during milking occupy a central place [10], a fundamental principle at the top of all programs for udder health control [11]. Simple but rigorous gestures, such as teat disinfection before (pre-soaking) and after milking (post-soaking), thorough drying of teats with individual wipes, and elimination of first sprays, are recognized as fundamental preventive measures to limit the transmission of pathogens, whether contagious or

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environmental [12]. Recent studies confirm that the omission of these practices constitutes a major risk factor, directly correlated with an increased prevalence of clinical and subclinical mastitis [13, 14], a conclusion corroborated by multiple epidemiological studies worldwide.

In this national context, several major dairies, keen to improve the quality of their supplies, have recently initiated programs to make udder hygiene products (soaking products) available to their breeder-suppliers. These initiatives have been accompanied by awareness-raising sessions designed to encourage the adoption of best practices. This is precisely the background to the present study in the Ouaguenoun region in Algeria. It appeared essential to assess, in the field, the real appropriation of these new routines by breeders and to analyze their actual impact on herd mammary health. Consequently, the objectives of this survey were twofold. Firstly, to draw up a precise inventory of milking hygiene practices on dairy cattle farms in this region. Secondly, the study aimed to quantify, through a case-control approach, the strength of the association between specific hygiene practices and the mammary health status of the farms, in order to identify the predominant risk factors in this local context. Identifying these factors is crucial to guiding advice and training more effectively and ultimately to improving herd health and the quality of milk produced over the long term.

Material and Methods

Study area and farm selection

The study carried out in the Ouaguenoun region (Tizi Ouzou, Algeria), an area with high dairy cattle farming activity. The study population selected from an exhaustive list of 421 dairy farms provided by the region's main dairy. The selection process took place in two stages, based on the size and the location criteria:

- Size criterion: Only farms with more than 10 dairy cows were selected, reducing the eligible population to 72 farms.

- Location/Geographical criterion: Of these, the study focused exclusively on those located in the Ouaguenoun commune, resulting in a target population of 30 farms.

Descriptive survey and data collection

A descriptive cross-sectional survey was carried out on the 30 target farms. Data were collected during farm visits, using a standardized survey grid. The questionnaire made it possible to document farmers' practices in detail along four main axes:

- Structural characteristics of the farm: type of housing, sleeping area per animal, type and management of bedding, source of water.

- General management and environmental hygiene: farm cleanliness, effluent management.

- Milking hygiene routine: operator hand-washing, order of milking, elimination of first sprays, udder washing and drying methods, use and application techniques for pre-soaking products (pre-foaming).

- Post-milking practices and equipment maintenance: draining, post-soaking application, milking machine cleaning and disinfection protocol.

Case-control study

To assess risk factors, a retrospective case-control study was carried out in the target population.

Definition of health status and grouping

The mammary health status of each farm was determined by longitudinal monitoring of tank milk quality. The use of the California Mastitis Test (CMT) on tank milk is recognized as a reliable and inexpensive tool for estimating the prevalence of subclinical mastitis in a herd [15]. In line with epidemiological approaches aimed at classifying farms based on their health history [16], four consecutive monthly checks were carried out. This repeated monitoring makes it possible to overcome one-off variations and establish a stable health profile for each farm [17]. On this basis, the following classification adopted:

- Case group: farms with a problematic mammary health status, defined by at least two (≥ 2) positive CMT reactions out of the four tests carried out.

- Control group: farms with an acceptable mammary health status, defined by at most one (≤ 1) positive CMT reaction out of the four tests performed.

Matching and final group composition

In order to limit confounding bias, farms matched based on three fundamental criteria: herd size, daily milk production and systematic use of mechanical milking. Of the 30 farms initially monitored, 3 could not be matched and were therefore excluded from the case-control study. The analysis thus covered 27 farms, divided into 8 “Case” farms and 19 “Control” farms.

Statistical analysis

Descriptive analysis of farm characteristics was based on percentage calculations. A case-control approach was used to analyze risk factors. In this type of experimental work, the Odds Ratio (OR) is the appropriate measure of association to quantify the strength of the link between an exposure (hygiene practices) and the occurrence of the condition under study (health status "Case"). The OR was calculated and interpreted as an estimate of Relative Risk, a valid approach in case-control studies, particularly when the prevalence of the condition is low in the source population [18]. For each factor, the OR was

presented together with its 95% confidence interval (95% CI), which enabled the statistical significance and precision of the estimate to be assessed [19].

Results

This section describes the characteristics of the 27 farms studied and the results of the mastitis risk factor analysis.

General characteristics and environmental hygiene of the farms

The structural characteristics of the farms are detailed in Table 1. Almost all farms (92.6%) delivered more than 100 liters of milk/day. Semi-fenced housing was the dominant type (77.8%). Significant shortcomings in the animals' environment were observed: lying surface was deemed insufficient in 70.4% of cases, and bedding was absent or in insufficient quantity on almost all farms (11.1% and 88.9% respectively). Consequently, the general state of cleanliness was rated as "dirty" or "very dirty" on 66.7% of farms.

Milking practices and hygiene

All farms surveyed used mechanical milking via mobile milking carts. Milking practices, summarized in Table 2, revealed numerous shortcomings.

- Milking preparation: 48.1% of farmers never eliminated first milking, and only 29.6% did so systematically. Udder preparation consisted universally of washing with cold water, without wiping (non-drying) on 88.9% of farms. Pre-soaking was applied by only 25.9% of farmers. Among the latter, application was sub-optimal: contact time was less than 30 seconds for 43% of them, and wiping was carried out with a collective cloth.

- Milking and post-milking: Systematic post-soaking, a key preventive measure, was in place on only 25.9% of farms.

- Equipment hygiene: Cleaning of the milking cart was largely inadequate, with only cold water used by 63% of farmers, and systematically in an open circuit, contrary to recommendations.

Mastitis risk factors

The case-control analysis enabled us to identify and prioritize practices associated with unfavorable mammary health status (Table 3).

Three main risk factors stood out with high and statistically significant Odds Ratios (OR):

- Systematic non-removal of first jets before milking showed the strongest association with "Case" status (OR = 5.4; 95% CI [3.1 - 7.7]).

- Failure to pre- and post-dip teats was also a major risk factor (OR = 4.9; 95% CI [2.6 - 7.2]).

- Failure to dry teats after washing presented a risk of similar magnitude (OR = 4.9; 95% CI [2.6 - 7.2]).

Other practices, although showing an association of lesser magnitude, were identified. Milking cows with mastitis without a specific order (OR = 2.1; 95% CI [0.01 - 4.19]) and poor liner hygiene (OR = 2.1; 95% CI [0.01 - 4.19]) were associated with an increased risk. Other variables, such as whole udder washing vs. teats alone (OR = 1.3), liner rinsing (OR = 1.0), lying surface (OR = 0.2) or dripping practice (OR = 0.04) showed no statistically significant association with health status in our study.

Discussion

This study showed that, in the Algerian dairy context, the prevalence of mastitis is less an inevitability linked to a generally altered environment than a direct consequence of specific, high-risk procedural failures during milking. By quantifying and prioritizing these factors for the first time in the Ouaguenoun region, our work identifies precise, high-impact levers for action.

The finding of poor environmental hygiene, particularly litter management, corroborates earlier studies and confirms the existence of strong infectious pressure from environmental pathogens [20], a link constantly reaffirmed in the most recent literature [21]. However, our survey suggests a new dynamic: this situation, more marked than in a previous work on smaller herds [22], could reflect a mismatch between the growth in farm size and the professionalization of practices. In this context of high infectious pressure, omissions during the milking routine are no longer simple failures, but become major risk factors, as our case-control analysis demonstrates. In addition, it is well established that poor hygiene conditions of udders and/or barns represent the major sources of infection by pathogens responsible for environmental mastitis [15]. Similarly, Yahia et al. [23] recorded high prevalence of goat mastitis due to several factors, including poor hygiene practices, inadequate milking techniques (irregular milking schedules, and lack of proper sanitation during milking), and environmental stressors such as extreme temperatures and limited access to clean water in favor of the development of pathogens.

The originality of our results lies in the identification of a clear hierarchy of three critical control points. Abandoning the elimination of first sprays (OR = 5.4) stands out as the predominant risk, a finding stronger than those reported in similar contexts [24]. This result highlights a lack of awareness of the dual function of this gesture: reduction of the initial bacterial load and early clinical detection, two pillars of contagion prevention [10]. Secondly, the absence of teat disinfection by pre- and post-dipping (OR = 4.9) confirms the

existence of a gap between the global scientific consensus on its prophylactic efficacy [25]. Finally, the equivalent risk associated with teat non-drying (OR = 4.9) contrasts with older local studies [26] but aligns perfectly with current knowledge on bacterial transmission and disinfectant dilution [10, 27].

Although the cross-sectional nature of the study dictates cautions in establishing definitive causality, the strong magnitude of the associations measured and their consistency with known biological mechanisms lend considerable robustness to our findings. The latter indicate that existing awareness programs fail to translate into rigorous practices, a discrepancy frequently observed in various dairy contexts [23]. The issue is therefore not just the dissemination of information, but the behavioral adoption of specific routines.

Conclusion

The results of this study showed that the risk of mastitis at herd level in the Ouaguenoun region is mainly determined by the omission of simple, but critical, hygiene gestures during milking. By prioritizing the risk factors, our analysis revealed three preponderant control points: non-elimination of first sprays, absence of teat disinfection and inadequate udder drying. The high magnitude of the risks associated with these failures (OR ≈ 5) reveals that substantial gains in mammary health are achievable via targeted interventions. Consequently, this work calls for a paradigm shift in livestock advisory strategies. Rather than general awareness-raising campaigns, an evidence-based approach focused on the rigorous mastery of these three fundamental practices represents the most effective lever for action. Improving the economic performance and sustainability of the local dairy industry therefore relies less on technological investment than on transforming this scientific knowledge into procedural discipline in the field - a strategic imperative for extension services and dairy processors alike.

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Declaration of Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical of approval

All the animal studies conducted with the utmost regard for animal welfare, and all animal rights issues appropriately observed. No animal suffered during the course of the work. All the experiments carried out according to the guidelines of the Institutional Animal Care Committee of the Algerian Higher Education and Scientific Research (Agreement Number 45/DGLPAG/DVA.SDA. 14).

TABLE 1. Characteristics of farm typology

Variable	Expression of the variable	Number of farms	%
Milk délivre	≥ 100L	25	92.59
levés/Day	≤ 100L	2	7.40
Type of	Hampered	6	22.22
stabling	Semi hampered	21	77.77
Surface of	Sufficient	8	29.62
staying	insufficient	19	70.37
Litter	Absent	3	11.11
	Insufficient	24	88.88
	Sufficient	0	0
Cleanliness	Clean	4	14.81
Of the farms	Little dirty	5	18.51
	Dirty	15	55.55
	Very dirty	3	11.11

TABLE 2. Milking conditions

Parameter	Expression of the variable	Number of farms	%
Treat of the cows with mastitis	Manually	14	51.85
	In last	11	40.74
	Without distinction	2	7.40
Rinsing of the sleeves before there treats	Systematically	0	0
	occasionally	3	11.11
	Never	24	88.88
Elimination of the 1st jets	Never	13	48.14
	occasionally	6	22.22
	Systematically	8	29.62
Cleaning of the udder & teats	Cold water	27	100
	Warm water	0	0
	Hot water	0	0
Areas cleaned	Udder & teats	0	59.25
	teats	16	40.74
	Yes	3	11.11
	No	24	88.88
	Towel	0	0
	collective	3	11.11
Pre foaming	Never	20	74.07
	occasionally	0	25.92
	Duration >30 dry	3	14.81
	< 30 sec	20	11.11
Draining	Yes	7	74.04
	No	4	25.92
Duration of treats	Inferior	20	14.81
	Average		74.04
	Superior	3	11.11
Post soaking	Yes	72	25.92
	No	0	74.07
Washing of the cart	Cold w a t e r	17	62.96
	Hot water	0	0
	Water + detergent	10	37.03

TABLE 3. Characteristics of cow husbandry and milking with corresponding Odds ratios

Risk modality vs. reference modality	Case	Control	Odds ratio [95 % IC]
No elimination of the first jets vs	7	9	
elimination of the first jets	1	7	5.4± 2.3
No realization of pre and post soaking vs	7	10	4.9 ± 2.3
Realization of pre and post- soaking	1	6	
No drying of the teats vs	7	10	4.9 ± 2.3
Drying of the teats	1	6	
Treat of the cows with mastitis without	1	1	2.1± 2.09
distinction vs with distinction	7	15	
Bad hygiene of the sleeves vs	1	1	2.1± 2.09
Good hygiene	7	15	
Washing udder & teats	5	9	1.3± 2
Washing teats	3	7	
Not rinsing of the sleeves before there treats	7	14	1± 2.5
Rinsing of the sleeves	1	2	
Staying surface insufficient	4	13	
Surface sufficient	3	3	0.2± 1.8
Realization of draining	3	15	
No realization of draining	5	1	0.04 ± 2.5

References

1. Houari, C., Mimoune, N., Ait-Issad, N., Kadri, A.Y., Aiza, A. and Khelef, D. Impact of a feed additive (acidifier and toxin-binder) in milk production in dairy cattle. *Veterinarska Stanica*, **55** (3), 267-278 (2024). https://doi.org/10.46419/vs.55.3.9
2. Saidi, R., Mimoune, N., Benaissa, M.H., Baazizi, R., Aissaoui, F.Z., Behalil, M. and Kaidi, R. Camel mastitis in Southern Algeria. *Veterinarska stanica*, **52** (3), 315-322(2021). https://doi.org/10.46419/vs.52.3.9
3. FAO. The State of Food and Agriculture 2023: Revealing the true cost of food to transform agri-food systems. Rome (2023).
4. Mimoune, N., Saidi, R., Benadjel, O., Khelef, D. and Kaidi, R. Alternative treatment of bovine mastitis. *Veterinarska Stanica*, **52** (6), 639-649 (2021). https://doi.org/10.46419/vs.52.6.9
5. Rollin, E., Bicalho, R. C. and Lhermie, G. A systematic review and meta-analysis of the global economic impact of bovine mastitis. *Journal of Dairy Science*, **105**(11), 9115-9132 (2022).
6. Kebbal, S., Belala, R. and Mimoune, N. Economic impact of mastitis in dairy cattle farms in Blida, Algeria. *African Journal of Biological Sciences*, **6**(16). 173-182 (2024).
7. Scherer, J. K. and Schmidt, R. M. Monitoring milk quality and udder health in large herd management (1992). In H. H. Van Horn & C. J. Wilcox (Eds.), *large dairy herd management* (pp. 475-486). American Dairy Science Association.
8. Barbano, D. M., Ma, Y. and Santos, M. V. Influence of raw milk quality on fluid milk shelf life. *Journal of Dairy Science*, **89** (E-Suppl.), E15-E19 (2006).
9. Bouroutzika, E., Proikakis, S., Anagnostopoulos, A. K., Katsafadou, A. I., Fthenakis, G. C. and Tsangaris, G.T. Proteomics Analysis in Dairy Products: Cheese, a Review. *Applied Sciences*, **11**(16), 7622 (2021). https://doi.org/10.3390/app11167622
10. Godden, S. M., Royster, E. and Kelton, D. Symposium review: Key performance indicators and benchmarking for mastitis and milk quality control in the United States and Canada. *Journal of Dairy Science*, **102**(8), 7644–7661 (2019). https://doi.org/10.3168/jds.2018-15955
11. Ózsvári., L and Ivanyos, D. The use of teat disinfectants and milking machine cleaning products in commercial Holstein-Friesian farms. *Front. Vet. Sci.*, **9**, 956843 (2022). doi: 10.3389/fvets.2022.95684
12. Bava, L., Zucali, M., Sandrucci, A. and Tamburini, A. The effect of milking routine on milk yield and milk flow-rate. *Journal of Dairy Research*, **78**(2), 133-138 (2011).
13. Kayitsinga, J., Schewe, R. L. and Erskine, R. J. Management practices associated with bulk tank somatic cell count in smallholder dairy farms in Rwanda. *Journal of Dairy Science*, **100**(2), 1364-1374 (2017). https://doi.org/10.3168/jds.2016-11756
14. Slettbakk, T., Norell, L., and Lindberg, A. Risk factors for high somatic cell count in Norwegian dairy herds. *Acta Veterinaria Scandinavica*, **62**(1), 1-10 (2020).
15. Belabdi, I., El Amine Bekara, M., Djebbar, A., Sebaihia, M., Ait Issad, N. and Mimoune, N. Prevalence and risk factors of subclinical mastitis in goats in western Algeria. *Veterinarska Stanica*, **55** (6), 667-675 (2024). https://doi.org/10.46419/vs.55.6.1
16. Barkema, H.W., Schukken, Y. H., Lam, T. J., Beiboer, M. L., Wilmink, H., Benedictus, G. and Brand, A. Incidence of clinical mastitis in dairy herds grouped in three categories by bulk milk somatic cell counts. *Journal of Dairy Science*, **81**(7), 1835–1843 (1998).
17. Green, M. J., Green, L. E., Medley, G. F., Schukken, Y. H. and Bradley, A. J. Influence of quarter-level risk factors on clinical mastitis. *Journal of Dairy Science*, **87**(12), 4173–4179 (2004).
18. Rothman, K. J., Greenland, S. and Lash, T. L. Modern Epidemiology (3rd ed.). Lippincott Williams & Wilkins (2008).
19. Bland, J. M. and Altman, D. G. The odds ratio. *BMJ*, **320**(7247), 1468 (2000).
20. Pantoja, J. C. F., Hull, L. C. and Ruegg, P. L. Somatic cell count status and associations with management practices in Wisconsin dairy herds. *Journal of Dairy Science*, **92**(11), 5366-5375 (2009). https://doi.org/10.3168/jds.2009-2244
21. Rowbotham, F. A. and Bicalho, R. C. Invited review: The impact of bedding materials on the dairy cow udder and teat microbiota. *Journal of Dairy Science*, **105**(8), 6299-6312 (2022).
22. Ameur, A., Rahal, K. and Bouyoucef, A. Effectiveness of refrigeration tank cleaning on Friha dairy farms (in French: Efficacité du nettoyage des tanks de réfrigération dans les fermes laitières de Friha). *Nature & Technologie* **6**, 80-84 (2012).
23. Yahia, A., Abdul-Hussain, A., Hamrat, K., Ait Amrane, A., Belala, R. and Mimoune, N. Prevalence and risk factors associated with subclinical mastitis (SCM) in goats in a Southern part (Ghardaïa) of Algeria. *Journal of Applied Veterinary Sciences*, **10**(3), 8-14 (2025). doi: 10.21608/javs.2025.368321.1561
24. M'sadak, Y. Study of milk cell counts and descriptive analysis of mastitis risk factors in barn cattle farming in the Monastir region (Tunisia) (in French : Etude des numérations cellulaires du lait et analyse descriptive des facteurs de risque des mammites en élevages bovin hors sol dans la région de Monastir (Tunisie)). *Nature & Technologie*, **10**, 56-61 (2014).
25. Ruegg, P. L. A 100-Year Review: Mastitis detection, management, and prevention. *Journal of Dairy Science*, **100**(12), 10381–10397 (2017). https://doi.org/10.3168/jds.2017-13023
26. Kebbal, S. Descriptive study of mastitis risk factors and managerial characteristics of dairy farms in the wilaya of Blida. *Agrobiologia*, **10**(1), 1975-1985 (2020).
27. Gleeson, D., O'Brien, B. and O'Driscoll, K. Effect of pre-milking teat disinfection on new mastitis infection and teat condition in dairy cows. *Irish Veterinary Journal*, **71**(1), 10 (2018). https://doi.org/10.1186/s13620-018-0122-3

ممارسة الحلب وعوامل الخطر لالتهاب الضرع البقري

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الملخص

في الجزائر، تُفاقم بعض الإغفالات البسيطة في روتين الحلب، مثل غياب تغميس وتطهيرالحلمة بعد الاستخدام، من خطر تدهور صحة الضرع على مستوى القطيع. ولتحديد نقاط التحكم الحرجة هذه، أجرينا دراسة حالة على 27 مزرعة ألبان في شمال الجزائر، حيث تم تحديد حالتها الصحية من خلال المراقبة الطولية لحليب الخزانات الكبيرة (اختبار التهاب الضرع في كاليفورنيا). وكشف التحليل عن وجود ثلاث ممارسات مرتبطة ارتباطًا وثيقًا بحالة إشكالية: عدم التخلص من اللبن الأولي (نسبة الأرجحية = 5.4)، وغياب تطهير الحلمة قبل الحلب وبعده (نسبة الأرجحية = 4.9)، وعدم تجفيف الحلمة بشكل كافٍ (نسبة الأرجحية = 4.9). وتُظهر هذه النتائج، التي أُجريت في سياق دراسة استقصائية مقطعية كشفت أوجه قصور واسعة النطاق في النظافة، أن الإخفاقات المحددة والقابلة للتعديل هي العوامل الرئيسية لتحسين الوضع. نستنتج أن خطر التهاب الضرع على مستوى القطيع في هذه المنطقة يتحدد بشكل رئيسي بإهمال إجراءات النظافة البسيطة والضرورية أثناء الحلب. ومن خلال تحديد أولويات عوامل الخطر، كشف تحليلنا عن ثلاث نقاط تحكم رئيسية: عدم إيقاف الرشات الأولى، وعدم تطهير الحلمات، وعدم تجفيف الضرع بشكل كافٍ.

الكلمات الدالة: الأبقار، التهاب الضرع، الحلب، الممارسة، عوامل الخطر.