Prevalence of Lameness In Cattle – Associated Herd Level Risk Factors -

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Abstract
Defined as a severe welfare problem, lameness in cattle is associated with impaired locomotion and lesions of the hind limb, affecting fertility, milk yield, and considerable economic losses. This study aims to determine the prevalence of lameness and to establish risk factors involved in herd lameness in cattle within a farm in the north-eastern part of Romania. A total of 370 animals were scored for lameness as well as for other information on individual cows (parity, body condition score, milk yield, days in milk). Additional information like nutrition, resting, cow comfort, social confrontation, and density were also collected. Thus, herd lameness prevalence ranged between 0 to 72%, with a mean of 22%. Higher milk production was associated with lower chances of being lame. Compared to first parity, multiparous cows had higher odds of being lame, which was also correlated with a low body condition score (<2.5). Overgrown claws, injured hocks, slippery floors, hygiene and care were also correlated with this condition, emphasizing the importance of housing conditions and welfare. Therefore, actions like improving management practices in order to improve cow welfare as well as detection and proper treatment of this disorder promptly are essential for dairy herds.

Keywords: cattle, lameness, risk factors, welfare.

1. Introduction

After mastitis and reproductive diseases, lameness is regarded as the third leading source of financial losses on dairy farms. More typically impacted by mastitis, metabolic problems, and poor fertility [1], are lame cows. In dairy cattle, the degree of lameness can vary widely and can develop weeks or sometimes even months after a metabolic condition, making the identification of etiological agent to be complex and challenging [2].
Lameness is defined as being any infectious or non-infectious foot or limb disorder that negatively influences cow locomotion, posture, and mobility [3]. Claw injuries, whether non-infectious like white line disease, sole ulcer or infectious like: digital dermatitis (DD) or interdigital dermatitis, and interdigital phlegmon or heel erosion are the leading causes of lameness in dairy cows [4].
Typically, lameness is identified in the late stages of the disease, requiring quick and generally costly treatments. An animal in this condition may require several weeks to rehabilitate, resulting in substantial costs for dairy farmers in terms of resources and time spent on veterinarian visits, medications, and treatments [5]. Moreover, as lameness is linked with higher laying behavior, it is likely that lameness increases the risk of mastitis, one of the most expensive production disease in dairy cattle [6].
Regarding lameness prevalence around the world, there are several studies that mention wide ranges between 5.1% in Sweden [7] to 36 % in United Kingdom [8], 54.8% in the United States of America [9] and even 72% Europe [10], the

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intensive livestock farming system exhibiting a higher prevalence compared to extensive livestock farming system.

Clinically, lameness is associated with fever, anorexia, decreased milk production, discomfort, swelling, and mobility loss.

In subclinical situations, lameness is frequently absent, but milk production can be diminished [11], emphasizing thus, the necessity of early detection. Without an early diagnosis of lameness, feed intake decreases as a result of the inability of the animal to stand or walk for feed, and the milk yield gradually declines, while the pain levels increases.

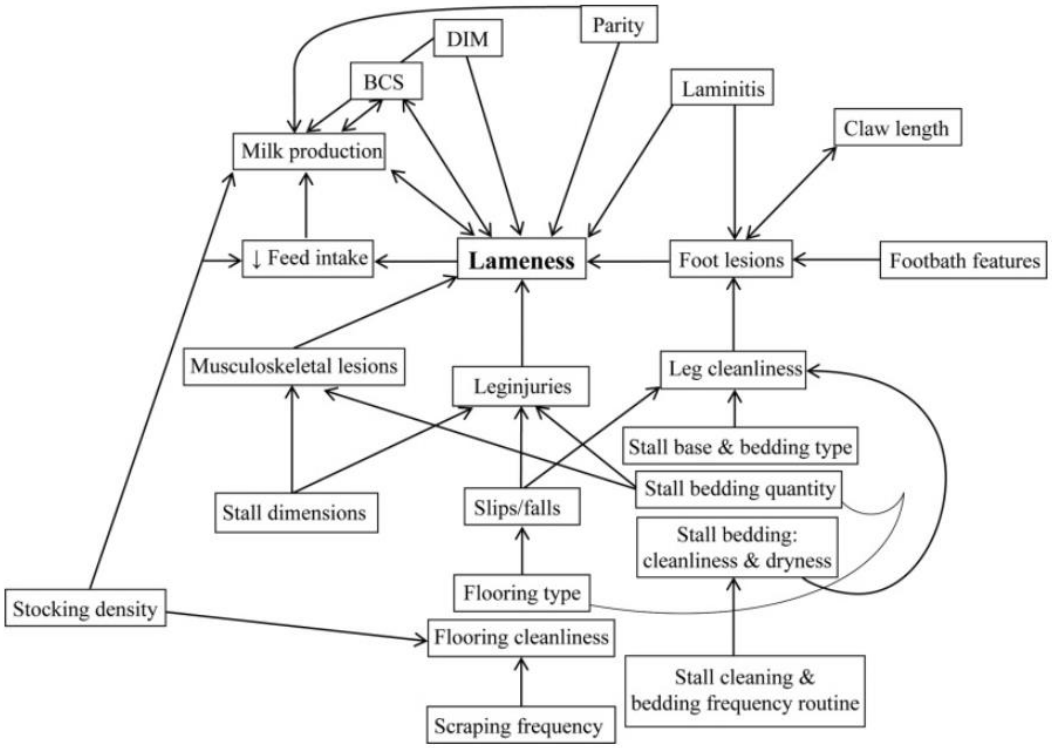

Figure 1. Associated risk factors for lameness in cows (Solano L. et al., 2015)

The disorders associated with lameness have several etiological agents. Thus, understanding and recognizing risk factors for disease prevention [12] is vital. Risk factors at the individual, herd, and farm levels must be taken into account when choosing the most effective strategies in order to prevent lameness in dairy cows. Farm management, feeding management, animal genetics, housing systemm, different breeding circumstances and technologies are significant risk factors for lameness in dairy cows [11].

Nevertheless, despite significant effort in lameness studies, there are still concerns about the rising prevalence of lameness in dairy herds.

Thus, the objective of this study was to determine the prevalence of lameness and the relationship between herd and cow characteristics in connection to the prevalence of lameness.

2. Materials and methods

A total of 370 animals were scored for lameness as well as for other information on individual cows like parity, body condition score, milk yield, and days in milk.

Additional information like nutrition, resting, cow comfort, social confrontation, and density were also collected, but some of the parameters were used for another study.

The cows were kept in free-stall housing system, with concrete flooring covered with mattresses and fed with a total mixed ration (TMR) twice a day, and ad libitum water. All the information

regarding each animal were recorded and processed during a screening performed in order to establish the general health status of the herd and as we mentioned below, concerned several segments, but in the present study we will refer only to lameness and its risk factors.

3. Results and discussion

Even though the population is limited, this study highlights the lameness prevalence and its risk factors on a farm level. In total, 370 cows were scored for lameness while walking, and included information on individual cows, management practices, and facility design. These data were related to foot disorders and poor health status. At the herd level, lameness prevalence ranged between 0 to 72%, with a mean of 22%.

Regarding the correlations between lameness and the presumptive risk factors, the statistical analysis emphasized that lameness increases with parity, taking into consideration that compared to 1st parity (3%), cows in > 2 parturitions had higher odds of being lame. According to Weber A. et al., [13], the prevalence of non-DD lameness is higher in older cows, potentially due to their increased parity (lameness rises with increasing parity) and age-related wear and stress on the claws. Contrary to the mentioned study, there are also studies claiming that the prevalence of DD lameness is smaller in older cows, possibly due to an increased immunity [14].

Moreover, a low body condition score (BCS) ≤2.5 was positively correlated with lameness, compared to cows with a higher body condition score, these results being comparable with another study published in 2019 [15], in which it is mentioned that low body condition score, prolonged time spent in the corral, cows confined to paddocks during the dry summer months, and poor hygiene are directly linked to impaired mobility score. (table 1).

Another two important risk factors strongly correlated with lameness in dairy cattle were represented by injured hocks and overgrown claws (table 1).

The link between lame cows and injured hocks was interpreted by Heyerhoff Z. et al. [16], who concluded that lame cows had trouble lying down or getting up, resulting in abrasion of the hock area. Other risk factors for injuried hocks in cows, can be represented by the presence of stones, dirt, or other potential risks on the track. A poor relationship between workers and animals will make them scared of humans and more likely to avoid them during routine inspections and handling, increasing thus, the probability of injuries in cows [12,17]. As for the overgrown claws as a risk factor for lameness, inconsistent hoof trimming and insufficient hoof wear can also contribute to an increased prevalence of this condition.

Regarding slippery floors, in our study, this parameter was strongly correlated with lameness, body condition score, nutrition, parity, and overgrown claws. Although few research have examined slippery floor parameter, Solano et al. [18], found that floor slipperiness is linked to an increased prevalence of lameness. The role of slippery floors to aberrant hoof wear and potential musculoskeletal injuries due to slips or falls is unknown; nonetheless, this is a possible reason for the higher occurrence of lameness in farms with non-abrasive pavements [19].

Similar to other studies, lameness has higher odds where the housing system has wet floor conditions, which are less abrasive, restricting the locomotion of cows. These have a reduced ability to walk, lie down, and can be predisposed to injuries and unnatural walking. The other parameters taken under consideration in our study strongly correlated with lameness were also hygiene, nutrition, and density. The correlation between hygiene and lameness demonstrates that cleanliness levels and lesions on the bodies of cows reflect the design of the housing system.

For dairy cattle farms, management of lameness includes both prevention and treatment. Prevention includes the management of risk factors for lameness, including the improvement of walking surfaces, nutrition, and heredity.

Before a lame cow can be cured, the veterinarian / operator must identify it as lame. Typically, this occurs in three ways: implementing a locomotion rating system in order to evaluate a herd is the first step; the second step is routine hoof care; thus, legs are lifted, examined, and if necessary, treated. Third, and most frequent, is observation during other tasks, such as herding. As a corrective measure for preventing lameness in dairy cows, it is recommended that herds should be evaluated for locomotion score at least once a month. However, completing locomotion scoring or routine hoof clipping on a regular basis is typically

considerably less common, and some farms don't do either of these things at all.

Table 1. Correlations between lameness and potentially risk factors in dairy cattle

	Density	Hygiene	Nutrition	Injured hocks	Overgrown claws	BCS	Parity	Slippery floors	Lameness
Density	1.000	0.406**	0.211**	0.034	0.159**	0.167*	0.161*	0.161*	0.310**
Hygiene		1.000	0.198**	0.215**	0.345	0.164*	0.159*	0.063	0.170**
Nutrition			1.000	0.115*	0.319**	0.301**	0.299**	0.333**	0.396**
Injured hocks				1.000	0.132**	0.398**	0.382**	0.093	0.203**
Overgrown claws					1.000	0.798**	0.797**	0.984**	0.725**
BCS						1.000	0.991**	0.791**	0.765**
Parity							1.000	0.790**	0.758**
Slippery floors								1.000	0.751**
Lameness									1.000

4. Conclusions

As a final conclusion, the prevalence of lameness might be reduced by improving the management of multiparous, underweight, or injured cows, as well as by adopting management methods designed to increase cow welfare, specifically the slip resistance of the floor and the lying surface of the stall.

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