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Frequency and Distribution of Pathologies Associated with Lameness Problems in Commercial Dairy Herds in Baja California, México

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Abstract: In order to determine the frequency and distribution of lesions and/or diseases associated with lameness problems in commercial dairy herds with Holstein cows, in Baja California, Mexico, a two stage transverse epidemiological study was carried out in 592 milking cows with frequent lameness. During the first stage, a locomotion scoring method (LS), index that measures the cow's capacity to walk was used. Cows were observed during milking assigning to each a score of 1 to 5, where LS1 represents a normal cow and LS5 represents cases of severe lameness. Results gave a 17.5% frequency of evident and severe lameness. During the second stage of this study, 37.5% (39/104) of the cows that had these scores (LS4 and LS5) were randomly selected and carefully inspected in order to detect and classify severe pathologies. In total, 89 lesions were detected; of these, 36% were linked to white line disease; 27% to double sole; 15.7% to corkscrew claw; 6.8% to fissures (vertical and horizontal); the remaining lesions (14.5%) were associated with abscess and talon ulcer cases, as well as digital and interdigital dermatitis. In conclusion, the high frequency of white line disease and double sole in the region may be mainly associated to two factors: diet formula and the lack of a routine preventive hoof trimming program.

Key words: Dairy herd, lameness, double sole, preventive trimming

INTRODUCTION

Productive and reproductive stress conditions to which highly productive cows are subjected promote the presentation of sanitary problems in the herd. One of the problems that have a higher impact is the one related with locomotion or lameness problems [1]. Economic impact of lameness has been extensively studied. Certain researchers[2,3] report that treatment costs are generated when there is affected cattle, as well as a reduction of milk production between 10 and 50% with adverse effects on body condition of cows. This can partly explain reproductive failures that have been associated to lameness, since there is an increase of the calving to conception period by 20 to 40 days as compared to healthy cows[4,5]. Lameness is the third most important cause of slaughter of cattle after reproductive and mastitis problems[6]. In the United States, it was reported that during 1996, 15% of dairy cattle sent to slaughter was caused by lameness[7]. Such problems are common in dairy cattle herds, since incidence has been detected between 20.6 and 55% [5,8,9]. In the Tijuana, Baja California, dairy basin there is a culling rate in productive cows of approximately 25%. Due to orographic and climatic characteristics, problems associated to feet are very significant in herds, since of animals sent to slaughter before their productive life is over, between 40 to 50% are associated with lameness (AGLPLT). Most of the dairy farms do not have an integral program that prevents or opportunely detects these problems. Corrective treatments are only applied to animals with severe lameness but lesions are neither classified nor recorded and therefore the distribution of disease is not known in the region. Due to the above, the objective of this study was the determination of frequency and distribution of lesions and/or diseases associated with lameness in two commercial dairy herds of Valle del Carrizo, in the municipality of Tijuana, Baja California, Mexico.

MATERIALS AND METHODS

Reference population: This study was carried out in the dairy basin located in Valle del Carrizo in Tijuana, Baja California, Mexico. It is located at 32° 43' 19'' (latitude North), and 117°.0 43' 19" (longitude west), average annual rainfall is 196.2 mm. The study was carried out in dairy farms of this basin because of the history of recurrent lameness, high culling due to these causes and the nearness between them. Also, they did not have preventive hoof trimming and they only care for hoofs to

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correct severe animal lameness. Records were not maintained of the treated animals or of the type of lesion or disease that was detected. Therapeutic treatment was the application of Terramycin powder (Terramicina® HLS, Pfizer), to all animals not taking into consideration the type of lesion they might have. The valley has approximately 3,800 milking cows in 10 commercial dairy farms located on 850 hectares. Each dairy has an average of 380 milking cows. The farms have the same general handling conditions, the cows are milked twice daily (average production is 28 liters/day), they have an average of 120 open days and 2.5 services per conception. Diet supplied to the cows is integral and contains a mixture of commercial dairy concentrate with a formula based on corn flakes and a complement of ground alfalfa hay at the rate of 50:50. During this study each cow consumed an average of 25 kg of feed per day. Feed is offered twice daily (at 03:00 and 14:00 h). Since the mixing truck does not have a scale, the amount of each ingredient that is added to the truck is estimated by the density of each ingredient and the volumetric capacity (1.3 m^3) of the power shovel that is used. Average productive life span of cows is 3-4 calvings and the culling rate is approximately 25%. Animals analyzed during this study represent 15.5% (592/3800) of the total animals present in this valley.

Locomotion scoring: The total amount of cows (n = 592 cows) of the two selected herds were observed individually when coming out of the milking parlor during a 10 m walk on a cement surface (approximately 15 sec) with the purpose of giving a score according to the Locomotion Scoring method (LS) as indicated by Sprecher *et al.*[11]. This index measures the walking ability of the cow and the score has a range of 1 to 5, whereby LS1 represents a cow with normal gait, LS2 means a mildly lame maintaining a normal column (flat and aligned) when standing but curved when walking, LS3 identifies a moderately lame animal, curved column is evident when standing as well as when walking and the steps are shorter when walking, LS4 describes a evident lame cow, with an evident curved column when standing or moving, and that also has altered locomotion with clear evidence of which foot is affected and LS5 represents a severely lame cow, that has an arched column when standing and while walking, also it refuses to walk and when it does so, the affected foot (or feet) is not leaned upon.

Selection of animals and diagnosis of lesions: A little over a third [37.5%, (39/104)] of the animals with evident and severe lame (LS4 and LS5) was randomly selected with the purpose of determining the type of lesion they had. The animals were placed in a hydraulic trap (Kansas®) in lateral decubitus in order to observe and detect possible lesions of the feet. Initially the anterior and posterior feet were washed with water and brush. Diagnosis was visual according to macroscopic appearance and location of lesions. Photographs of the most frequent typical pathologies were used to standardize the lesion scoring. A lame cow with white line disease was characterized by the disintegration of the union between the sole and the hoof wall with penetration of foreign bodies such as stones or excrement in this space[12]. In some cases, these bodies penetrated the sensitive lamina causing a septic laminitis with purulent abscess discharging on the coronet band. A lame cow with double sole was characterized by the separation of the union between the dermis and epidermis due to an accumulation of fluids and penetration of foreign bodies that had incorporated into the hoof[13]. A cow with corkscrew claw is characterized by having the lateral claw of rear leg affected more frequently, causing lameness with an overgrown hoof in the shape of a corkscrew due to excessive growth of the abaxial wall producing axial rotation of the hoof[14]. Animals that had severe and painful lesions had the corium affected and were treated with 2% lidocaine (2% lidocaine hydrochloride, 20 mL), Finadyne (Meglumina de flunixin, 2.2 mg Kg^{-1}, Schering Plough), Terramycin in powder (terramicina® HLS, Pfizer), also in the cases that it was needed a vinyl shoe was placed on the healthy hoof (Jorgensen, Lab. Loveland, CO) during three weeks to reduce pressure and pain in the affected hoof.

Data collection: Information of each of the observed cows was recorded in a format that included, amongst other variables the name of the owner, cow number, date, parity and type of lesion. Generated information was captured and processed using the program Microsoft Excel 2000[15].

Information analysis: Descriptive analysis of the information was carried out to generate indicators for general prevalence as well as in agreement with LS, and detected lesions or diseases, by means of the statistical program Statistix 2000[16]. Prevalence of general lameness was estimated as: number of affected cows with LS = 4 divided by the number of analyzed animals[17]. A simple linear regression analysis was executed to determine the relationship between LS and parity of the animals[16].

RESULTS

Locomotion scoring: A total of 592 milking cows were evaluated, 32.5% (192/592) presented mildly or moderately lame, and also 17.5% (104/592) had evident or severe lame (Table 1).

Table 1: Locomotion scoring of 592 milking cows in 2 commercial dairies

Score	Description	Amount	(%)
1	Normal	296	50.0
2	Mildly lame	127	21.5
3	Moderately lame	65	11.0
4	Evident Lame	85	14.3
5	Severely lame	19	3.2
	Total	592	100.0

Table 2: Diseases and/or lesions detected in 39 milking cows with LS 4 and LS 5 randomly selected (n = 104)

Disease and/or lesion	No. of lesions	(%)
White line	32	36.0
Double sole	24	27.0
Corkscrew claw	14	15.7
Fissures (vertical and horizontal)	6	6.8
Hemorrhages (toe and heel)	6	6.8
Digital dermatitis	3	3.4
Heel ulcers	2	2.1
Interdigital dermatitis	1	1.1
Abscesses	1	1.1
Total lesions	89	100

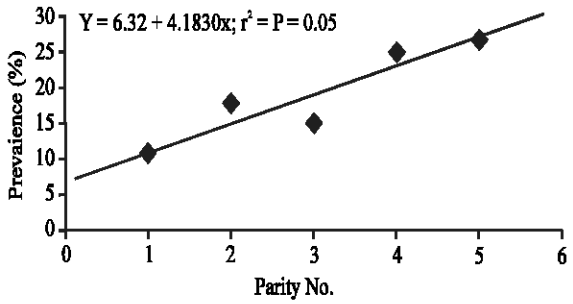

Fig. 1: Lameness prevalence by parity (LS≥4)

Lameness prevalence in relation to parity: General lameness prevalence was 17.5% (LS4 and LS5) and prevalence by Lactation (L) was 10.0, 17.7, 15.0, 25.7 and 26.6% for L1, L2, L3, L4 and L = 5, respectively. Also, a positive correlation was observed (r2 = 0.84, $p<0.05$) between the percentage of affected animals (LS = 4) and lactation (Fig. 1).

Diagnosis and lesion distribution: Thirty seven and a half percent (39/104) of animals with LS4 and LS5 were randomly selected for inspection to determine what disease or lesion was causing lameness. In total 89 lesions were detected in 39 animals; 74.3% (29/39) of the cows had more than one lesion. Thirty six percent of lesions were white line disease; 27% double sole; 15.7% corkscrew claw and the rest were other problems (Table 2).

DISCUSSION

Prevalence of Lameness: Lameness prevalence in dairy cows has been amply studied[3,5,8,9,11]. During this study, lameness was 17.5% (LS4 and LS5), although due to the nature of the type of evaluation, mildly and moderate lameness (32.5%) could have been not precise[17]. Nevertheless, 17.5% represents a 28% more than the 12.5% estimated by the Dairy Cattlemen's Association of Tijuana and it indicates that in the study region, that has an annual culling rate of 25% for different causes, 40 to 50% are cows slaughtered due to lameness problems. This can be explained two ways, in the first place lameness may well represent 70% of culling, or of the total LS4 and LS5 problems in a herd, only 30% of the affected cows are successfully treated and not sent to slaughter. We must recognize that the descriptive study does not include most of the predisposing factors within its analysis model, one of them is season of the year, since during the rainy season, general prevalence of lameness can come up to 50%[1]. This study was carried out during winter, in January and February. Nevertheless, during the previous year (2004), rains were 250 mm[21] above the estimated mean, and this could explain the prevalence that was observed.

Lameness prevalence by parity: Lameness prevalence behavior in relation to parity has been amply discussed[1]. In relation to this, mean prevalence for lactations 1, 2, 3, 4 and = 5 were 40, 46, 28 and 11%, respectively. Young animals had the tendency to be more susceptible to lameness. Notwithstanding the above, in our study (Fig. 1), the most affected animals were in parity 4 and = 5, a possible explanation would be, taking into consideration that these herds have a history of frequent lameness and that they do not carry out routine preventive trimming, that these animals had changes during early lactations and each lactation added more changes[1] increasing probability of later lameness[18]. If that should be the case, the importance of implementing preventive trimming programs in animals, especially during first lactations is confirmed[1].

Disease and lesion frequency: Double sole and white line diseases were more prevalent during this study, since together they made up 63% of the total amount of detected lesions. Even though several factors may be the cause of this problem, it has been reported that nutrition and the lack of a trimming program may be key factors in these processes[13]. Apparently, diet could not be a predisposing factor for acidosis, due to the nature of the diet which is generally consumed (50% alfalfa, 50% concentrate) in the amount of 25 kg day^{-1}, since the amount of neutral detergent fiber consumption was approximately 9.5 kg day^{-1} and starch only 5.6 kg day^{-1}. According to the fermentation model (NRC, 1989) expected ruminal pH is 6.4 and that does not represent a

risk for ruminal acidosis. Nevertheless, the way the diet was prepared (by participation of ingredients in the final ration) there could have been heterogeneity in the diet facilitating the presence of acidosis, although this was not evaluated in this study. On the other hand, the dairies in this region are not accustomed to perform routine preventive trimming, only corrective treatment is applied to severely affected animals. Some authors[21], evaluated the effect of hoof trimming on feet health and observed that a high percentage of detected and treated lesions (double sole, 97%; white line disease, 87%) during the autumn trimming had recovered well, when checked again during spring, although it could not be ascertained if this effect was only due to preventive trimming. Some authors mention that hoof trimming is prophylactic or therapeutic for many lesions that cause lameness[2] and it is recommended at least twice a year[21]. Considering the above, a possible explanation of the high frequency of white line disease and double sole in this region may be associated mainly to two factors: the way diets are prepared and the lack of a routine preventive hoof trimming program.

CONCLUSION

Considering that these herds have a history of frequent lameness; that routine preventive measures are not performed; that the persons in charge of treating feet do not apply any early lesions or disease detection method, it is possible that an integral program of opportune detection and treatment of animals in initial lameness phases (LS2 and LS3) could reduce the amount of cows that are severely affected. It's true that lameness problems cannot be totally eliminated by only one action, because of their multifactor nature, nevertheless an integral early detection program would permit culling reduction due to this cause.

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