



## Prevalence of non-infectious claw disorders in Egyptian dairy farms in relation to the flooring system

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### Abstract

Lameness is one of the most prevalent and costly maladies affecting dairy cattle. It has been ranked as the third after mastitis and reproductive failure. One of the leading causes of lameness is corium tissue damage and hence claw horn lesions development. Flooring system was found to have an impact on the development of such lesions. Therefore, the objective of the present study was to study the effect of flooring system on the development of four non-infectious claw disorders in Egyptian dairy farms. Another objective was to study the effect of claw disorders on reproductive performance and total milk production. Four dairy herds with earthen floor (n=2) and desert floor (n=2) from Ash-Sharkia and Ismailia Provinces were included in this study. Results revealed that the prevalence of white line disease (WLD) was the highest among recorded lesions in earthen floor farms 2.7% followed by sole ulcer (SU) 2.1% and sole abscess (SA) 1.7% then vertical wall fissures (VWF) 1.6%. While in the desert floor farms, VWF and SA were reported in 0.8% of animals followed by WLD and SU in 0.4% and 0.3% of animals, respectively. The non-infectious claw disorders were detected mainly in hindlimbs in earthen floor farms when compared to forelimbs 6.6% and 1.5%, respectively while in the desert floor farms were nearly equal for the forelimbs 1.1% and hindlimbs 1.2%. In conclusion, the animals housed in earthen floor farms were more susceptible to non-infectious claw disorders than those housed in desert floor.

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### Introduction

Lameness in cattle is one of the serious problems in dairy industry and represents the third in importance after mastitis and infertility (1,2). Approximately 90% of cases with lameness are due to claw disorders (3). During the past decades, in response to the demand of high milk productivity, intensive husbandry with free stall yards were implemented with high risks of claw diseases (4). About one third of Spanish dairy cows, 36% of the United Kingdom cows and 70% of Dutch cows have been reported with at least one claw disorder (5-7). Claw disorders can be classified into infectious (such as interdigital dermatitis and digital dermatitis) and noninfectious disorders (such as

Vertical wall fissure (VWF), White line disease (WLD), Sole ulcer (SU), Sole abscess (SA)) and each disorder has a specific effect on the performance of dairy cows (8,9).

Claw disorders affect the animal welfare and health that is the important issue in dairy herd production. In addition, they cause high economic complications due to reduced productivity, increased early culling risks, reduced fertility rates and costs of treatment (10,11). Several factors affect claw health and risk of claw lesions including environmental factors such as facilities designing and management practices and genetics (10,12-14). The environment has a great influence on the incidence of claw disorders and lameness in dairy herds. The flooring of the dairy farms has been shown to have a significant role in

claw health (15,16). Reduction in prevalence of claw disorders in cows housed in soft surface floors than those housed in concrete floors was previously reported (17).

In order to decrease the incidence of the claw disorders in dairy herds, more attention should be paid to the flooring system. The urgency of research about the suitable flooring is increased. Therefore, the objective of the present study was to study the effect of flooring system on the development of four non-infectious claw disorders in Egyptian dairy farms. In addition, to study the effect of claw disorders on reproductive performance and total milk production in one earthen dairy farm where farm records were available.

## Materials and methods

### Animals

In this study, two earthen (937 dairy cows) and two desert (901 dairy cows) Egyptian dairy farms in Sharkia and Ismailia provinces were included. In all farms, concrete floor was established around feed bunks and water troughs. Total mixed ration was supplied with free water access. Cows were milked three times daily in a milking parlor. Pregnant lactating cows were dried at the end of 7<sup>th</sup> month of pregnancy.

### Data collection

Lame cows were primarily collected from earthen and desert farms according to the farm records, herdsmen, claw trimmers and in addition to looking in yards and during walking to the milking parlor and subjected for further examination by our team during a total period of one year. Suspected cases were examined for lameness at standing and during walking on a leveled floor using a 5-point lameness scoring system (18). The locomotion scoring and assessment methods were previously described (11). Where, cows had lameness score 2-5 were further examined and the affected limb/limbs were identified. In this study, four non-infectious claw disorders were included (VWF, WLD, SU, SA) (Figure 1).

To study the effect of non-infectious claw disorders on reproductive performance and total milk production, data about calving interval, days open, No. services/conception, and total milk produced by both affected and healthy cows were collected from farm records. In an individual recording sheet, type of claw lesion, lameness score, affected limb/s, site of lesion, reproductive parameters (calving interval, days open, No. of services/conception, and lactation season) were written down.

### Statistical analysis

The prevalence of non-infectious claw disorders was compared between earthen and desert floor farms using Chi Square test. The difference in calving interval, days open, number of service per conception and 305-day lactation milk

yield between cows that were diagnosed with healthy feet and those identified with non-infectious claw disorders (data from earthen floor farm only) was examined using Wilcoxon rank sum test. The statistical analysis was performed using the SPSS statistical software version 17 (IBM, USA). The critical P-value was set at 0.05 for all analyses.



Figure 1: Different non-infectious claw disorders in cattle. A) WLD at the left lateral claw of the hindlimb (arrow). B) SU at the right lateral claw of the hindlimb (arrow). C) SA at the right lateral claw of the hindlimb (arrow). D) VWF of the left medial claw of the hindlimb (arrow).

## Results

### Prevalence of non-infectious claw disorders

The prevalence of non-infectious claw disorders was higher in earthen than desert floor farms with the percentages of 8.1% and 2.3%, respectively. The prevalence of WLD was the highest among recorded lesions in earthen floor farms with the percentages of 2.7% followed by SU with the percentages of 2.1% and SA with the percentages of 1.7% then VWF with the percentages of 1.6%. While in the desert floor farms, WF and SA were recorded in 0.8% of animals followed by WLD and SU were recorded in 0.4% and 0.3% of animals, respectively. Non-infectious claw disorders were detected mainly in hindlimbs in earthen floor farms when compared to forelimbs (6.6% and 1.5%). While in desert floor farms, the affections were nearly equal in both limbs with the percentages of 1.1% in forelimbs and 1.2% in hindlimbs (Table 1).

**Effect of non-infectious claw disorders on reproductive performance and total milk production**

The calving interval and days open were significantly increased in the affected cows than the normal ones. The

number of services/conception was nearly similar in both affected and normal cows. The total amount of milk produced per cow for the season was significantly decreased in the affected cows than the normal ones (Table 2).

Table 1: Prevalence of non-infectious claw disorders in Egyptian dairy farms in relation to flooring system

Item	Earthen floor farms (n=937 cows)			Desert floor farms (n=901 cows)			Overall prevalence (n=1838 cows)
	Forelimb	Hindlimb	Total N (%)	Forelimb	Hindlimb	Total N(%)	
WLD	4	21	25 (2.7%)	2	2	4 (0.4%)	29 (1.6%)
SU	1	19	20 (2.1%)	1	2	3 (0.3%)	23 (1.3%)
SA	3	13	16 (1.7%)	4	3	7 (0.8%)	23 (1.3%)
VWF	6	9	15 (1.6%)	3	4	7 (0.8%)	22 (1.2%)
Total	14 (1.5%)	62** (6.6%)	76 (8.1%)	10 (1.1%)	11 (1.2%)	21* (2.3%)	97 (5.3%)

\* Significance between earthen and desert floor farms,  $P < 0.05$ . \*\* Significance between forelimb and hindlimb of earthen floor farms,  $P < 0.05$ .

Table 2: Reproductive performance of both healthy and non-infectious claw disorders-affected dairy cows in earthen farm

Item	Mean $\pm$ SEM	
	Normal cows No. 277	Lame cows No. 67
Calving interval (Days)	313 $\pm$ 17	450 $\pm$ 18*
Days Open (Days)	157 $\pm$ 8	281 $\pm$ 27*
No. of services / conception	2.2 $\pm$ 0.1	2.6 $\pm$ 0.2
Total milk produced (Kg/cow/season)	8876 $\pm$ 322	7917 $\pm$ 290*

\* Significance between groups,  $P < 0.05$ .

**Discussion**

Lameness is an important issue in dairy farms causing severe pain and leading to much economic losses for producers (1,11,19). About 90 % of lameness incidence is due to claw lesions (20). The housing environment is obviously to have large impact in occurrence of claw lameness among dairy herds and the floor system is hypothesized as important and main factor in locomotion and claw health (21).

In the present study, it was noticeable that the non-infectious claw disorders included in this study were more prevalent in earthen than desert floor farms, 8.1% and 2.3%, respectively. This might be due to the ability of the desert floors to maintain dryness for longer periods especially during winter season that give more comfort to the animals and maintain the health of the claws (21). Moreover, keeping the dairy cows on pasture is associated with decrease in risks of lameness (22,23). In contrast, a study by (24) showed increased risks of WLD, SU and digital dermatitis in grazing farms for 24 h per day in comparison with housing farms for 24 h per day.

The earthen floors when compared to desert ones has the disadvantage of accumulating manure with high moisture content for a longer period with direct contact to cow claws. This has a detrimental effect on the claw horn and remains a

challenge in achieving satisfactory hygienic measures in the dairy farms (25).

In the present study, the hind limbs were affected more than the fore limbs in both types of dairy farms (3,26-29). This was attributed to the higher weight bearing on hind limbs due to overweight of udder in heavy milking cows and during late pregnancy (30). In addition, hind limbs are in direct contact with urine and manure than fore limbs which weakens claw horn and lower its resistance with the resultant claw lesions. WLD was the mostly recorded claw disorder among dairy cows in the earthen and desert floor farms followed by SU and SA then VWF.

Cattle lameness leads to major losses in the dairy herds. Reduction in milk production is one of the major losses in dairy farms that may be estimate around 25-35% (24,31). In addition, lowering the cow fertility by increasing days open and calving intervals as well as conception rate is considered major risk in dairy cows culling (32). Another factor of losses is the costs of lameness treatment and increased labor number and time of work (33). We investigated in the present study the effect of lameness caused by non-infectious claw disorders on the animals' reproductive performance and milk productivity. We found that the milk production was reduced by 9.6% in affected cows and so the fertility was decreased significantly (increasing calving intervals and days open) as previously recorded (2,8).

## Conclusion

WLD, SU, SA and VWF were more commonly occurred in earthen than desert floor farms. Milk production and reproductivity were significantly reduced in the affected cows. Further work is still required to apply such study on a large scale of dairy farms all over Egypt. Finally, we advise the owners and livestock managers to design their farms in the desert areas in order to decrease the incidence of non-infectious claw disorders and reduce their hazards on dairy productions.

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## Conflict of interest

The authors declare that they have not conflict of interest.

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## انتشار اضطرابات النسيج القرني غير المعدية في مزارع الأبقار الحلابة في مصر وعلاقتها مع نوع أرضيات المزارع

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### الخلاصة

يعتبر العرج من أكثر الإصابات انتشارا وأكثرها من حيث التكلفة التي تصيب الأبقار الحلاب. ويعتبر ثالث أكثر الإصابات شيوعا بعد التهاب الضرع وضعف الخصوبة. إن أحد الأسباب الرئيسية للعرج هو تلف الأنسجة الحساسة للظلف مما يؤدي إلى اضطرابات في النسيج القرني الأظلاف. وقد وجد أن نوع أرضية المزارع لها دور كبير في حدوث تلك الاضطرابات. لذلك هدفت هذه الدراسة إلى تقييم تأثير الأرضية الترابية والصحراوية في حدوث أربعة أنواع من اضطرابات النسيج القرني غير المعدية للأظلاف في مزارع الأبقار الحلابة في مصر. وقد تضمنت هذه الدراسة أربع مزارع ألبان بمحافظة الشرقية والإسماعيلية منها اثنتان ذات أرضية ترابية واثنتان ذات أرضية صحراوية. أظهرت النتائج أن مرض الخط الأبيض في الأظلاف هو أكثر اضطرابات الأظلاف شيوعا في المزارع ذات الأرضية الترابية بنسبة ٢,٧% يليه تقرح الظلف بنسبة ٢,١% وخراج الظلف بنسبة ١,٧% ثم تشقق جدار الظلف العمودي بنسبة ١,٦%. بينما في المزارع ذات الأرضية الصحراوية كانت نسبة تشقق جدار الظلف العمودي وخراج الظلف ٠,٨% ثم مرض الخط الأبيض في الأظلاف بنسبة ٠,٤% وتقرح الظلف بنسبة ٠,٣%. أظهرت النتائج أن نسبة حدوث اضطرابات النسيج القرني غير المعدية كانت أكثر في الأرجل الخلفية مقارنة بالأرجل الأمامية في المزارع ذات الأرضية الترابية كانت ٦,٦% إلى ١,٥%. بينما كانت النسبة متقاربة في الأرجل الأمامية بنسبة ١,١% والأرجل الخلفية بنسبة ١,٢% في المزارع ذات الأرضية الصحراوية. نستنتج من هذه الدراسة أن الحيوانات بالمزارع ذات الأرضية الترابية أكثر عرضة للإصابة باضطرابات في النسيج القرني للأظلاف عن مثيلاتها بالمزارع ذات الأرضية الصحراوية.