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Short Communication

Track way distance and cover as risk factors for lameness in Danish dairy cows

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ABSTRACT

This study investigates the effect of length and cover of track ways between barn and pasture on lameness in Danish dairy cows. We hypothesised that short track distances would be associated with a lower lameness probability of dairy cows compared to longer distances and that track ways with prepared cover (asphalt, gravel, slag, concrete, rubber) compared to no prepared cover (sand, soil and/or grass) would be associated with a lower lameness probability of dairy cows in grazing herds.

In total, 2084 dairy cows from 36 herds, grazing their dairy cows during summer, were individually assessed for their lameness status. The cows were further clinically examined for claw conformation and hock integument. Information on breed and parity per cow and size per herd was extracted from a national data base. Track way distance ranged from 0 to 700 m and was categorised as (1) <165 m or (2) ≥165 m. Cover of track way was categorised as (1) prepared (asphalt, gravel, slag, concrete, and/or rubber), (2) partly prepared or (3) not prepared (soil, sand, grass) for the surface of the majority of tracks used. The effect of track way distance and cover was evaluated for their impact on lameness using logistic analysis with a multi-level model structure. The probability for lameness did not change with track distance but increased with no (odds 4.0 times higher) or only partly prepared (odds 3.8 times higher) cover compared to prepared cover.

In conclusion, we found that having a cover on the track way was associated with decreased severe lameness in Danish dairy cows.

1. Introduction

There is a high herd prevalence of lame cows in cubicle loose housing dairy herds (Dippel et al., 2009; Thomsen et al., 2012; Burow et al., 2013a). Since lameness is associated with pain (Rushen et al., 2007) a decrease of lameness prevalence would indicate an animal welfare benefit. Grazing has been shown to have a potential to reduce the risk of lameness (Haskell et al., 2006; Hernandez-Mendo et al., 2007; Corrazin et al., 2010). However, with regard to Danish herds, Burow et al. (2013b) did not find any difference in the prevalence of lameness for herds grazing their dairy cows during summer – comparing summer and winter. Track way distance between barn and pasture and maintenance of the track way have earlier been found to affect locomotion (Harris et al., 1988; Chesterton et al., 1989) and claw condition (Baird et al., 2009; Barker et al., 2009; Olmos et al., 2009). The objective of this study was to investigate the effect of track way distance and cover on the probability for lameness in Danish dairy herds using grazing. We hypothesised that short track distances with added cover would be associated with the lowest lameness prevalence.

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2. Materials and methods

2.1. Target and study population

The target population was dairy cows of Danish herds with more than 100 cows, grazing during summer and being housed in barns with cubicle loose housing systems. The selection of study herds was based on a random sample of 401 farmers' responses to a questionnaire survey on grazing procedures of Danish dairy farms in 2009. A total of 36 herds met the inclusion criteria: herd size larger than 100 cows, cubicle loose housing system, being reachable by car within 250 km distance from research centre Foulum located in Jutland, farmer interested in participating in the study, offering complete questionnaire information, no big system changes during the study period, using a milking system being automatic or two times daily parlour/carrousel-milking, and grazing lactating and grazing dry cows until at least two weeks before calving. The selection of cows within the herds was done by random sampling before each farm visit, using sampling intervals (Dohoo et al., 2009, p. 38) on updated herd records obtained from a public data base from the Ministry of Food, Agriculture and Fisheries. The herd record list was sorted according to the CHR-number (cow identity number) of the animals which to some extent reflects the age of the animals. A total of 2084 lactating cows from all herds were studied.

2.2. Outcome and explanatory variables

Lameness was evaluated as described in Welfare Quality® (2009) using a three level score. A cow was scored 0 for normal gait, 1 for moderately lame and 2 for severely lame. Score 0 and 1 were categorised together and opposed to (severe) lameness in the analysis. *Hock integument, breed, parity* and *herd size* were evaluated as described by Burow et al. (2013a) and summarised in Table 1. Claw conformation was measured in a clinical examination as described by Corrazin et al. (2010) and Matiello et al. (2011). Claw conformation was categorised as 0 for normal and 1 for overgrown claws (Table 1). Observed cows with missing information on lameness ($N = 197$) were excluded from the study.

The *track distance* and *track way cover* between pasture and barn were recorded daily at herd level in the 36 herds by each herd manager 30 days before the farm visit. The *track distance* (in m) and the *track way cover* (open question with given examples) were recorded in a standardised form provided and introduced to by the first author. To ensure correct recordings, herd managers were called once at the beginning of the study. Within herds, track way distance was noted for a 30 day period prior to the clinical examination and was defined as distance from 'stable door' to entrance of pasture. If track way distance varied between days in the 30 day period, the mean track way distance was used in the analysis. The track way distance was categorised as: (1) <165 m, and (2) ≥165 m. The track way distance varied from 0 to 700 m in the 36 herds, and the threshold 165 m was the median track way distance. The track way cover was defined by type of cover and categorised as: 1 = cover prepared with asphalt, gravel, slag, concrete, and/or rubber, 2 = cover partly prepared and 3 = cover not prepared i.e. plain soil with or without grass cover. If track way cover varied between days in the 30 day period, the most frequent noted category was included in the analysis. The *flooring of* the *passage ways* inside the barn was categorised as: (1) slatted, (2) solid or (3) a mixture of slatted and solid. The distribution of herds among study categories is presented in Table 1.

The claw conformation, track way distance and cover, indoor flooring, passage ways, hock integument, breed, parity and herd size were included in the analysis as explanatory variables.

Table 1
Outcome variable severe lameness and potential risk factors in a study of lameness in 36 Danish dairy herds with short and longer track distances as well as non-added, partly added and added cover on track ways in 2010 ($N = 2084$ cows scored for lameness).

Parameter	Scored scale	Analysed scale	Number of scores per level
Lameness[a]	0: normal gait or moderately lame 1: severely lame	01	1688 396
Track way distance	1: <165 m 2: ≥165 m	12	1056 (18 herds) 1028 (18 herds)
Track way cover	1: prepared with any material 2: partly prepared with any material 3: not prepared	123	178 (3 herds) 580 (10 herds) 1326 (23 herds)
Hock integument[b]	0: normal or hairless patches <2 cm 1: at least one hairless patch, lesion ≥2 cm or swelling	01	1305 779
Breed	1: Danish Holstein 2: Danish Jersey, Red Danish Dairy, Crossbreeds Missing/Danish Red Holstein	12	1562 514 8
Parity	1: primiparous 2: multiparous	12	729 1355
Claw conformation[c]	0: normal 1: overgrown Missing	01	654 1422 8
Flooring of passage way	1: Slatted 2: Solid 3: Mixture of slatted and solid	122	1478 (26 herds) 426 (7 herds) 180 (3 herd)
Herd size[d]	1: <142 2: ≥143		1010 (19 herds) 1074 (17 herds)

[a] Scoring definition according to Welfare Quality® (2009).
[b] Scoring definition modified after Welfare Quality® (2009).
[c] Scoring definition according to Corrazin et al. (2010) and Matiello et al. (2011).
[d] Categorised by its median.