Claw lesions as a predictor of lameness in breeding sows

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Introduction

Lameness is a common problem in swine breeding herds. Lameness is an important reason for the premature removal of sows from breeding herds, second only to reproductive inefficiency. Although there are different causal factors associated with lameness, claw lesions are an important underlying cause for lameness (Penny et al., 1963; Dewey et al., 1993). Claw lesions are very common in pigs. A previous report (Gjein and Larssen, 1995) indicated that more than 96% of loose-housed sows and 80% of confined sows had at least one lesion on the lateral hind claws. Although sows with mild lesions may not appear to be in pain, severe claw lesions may cause pain and lameness. In addition to pain, claw lesions may permit entry of infections that spread upwards affecting joints, leading to lameness. Housing conditions and management factors are reported to be associated with development of claw lesions (Kroneman et al., 1993). Different factors such as the interaction between the floor surface and the horn of the claw (Simmins and Brooks, 1988), physical properties of the floor (Jensen, 1979), and dietary biotin levels (Simmins and Brooks, 1988) have been suggested to be associated with claw lesions in pigs. Not all claw lesions may be associated with lameness in pigs. A recent study has indicated a positive association between white line lesions and lameness in pigs (Anil et al., 2007). Despite the prevalence, studies on claw lesions in pigs are scant in the US. It is important to understand the association between claw lesions and lameness in order to minimize claw lesions and to reduce the level of sow removals due to lameness.

Materials and methods

Data for this study were collected from a large commercial swine breeding herd in Minnesota. Claws of 771 sows were individually examined for lesions on day 110 of gestation while the sows were in the farrowing crates. Lesions included erosions, cracks, and overgrowths. The

horny side wall and the volar (plantar) surface of the hoof were examined. The medial and lateral claws of each foot were examined for lesions on a severity scale (Gjein and Larssen, 1995) of 0 (no lesions noted) to 4 (severe). Areas on the claw were classified as side wall (composed of hard keratinized epidermis), heel (soft keratinized epidermis on the ventral aspect of the claw towards the posterior end, including overgrown heel), sole (hard keratinized epidermis anterior to the heel on the ventral aspect of the claw), junction between heel and sole, white line (junction between sole and side wall) and toe (anterior part of the sole). The numbers of lesions on each area were multiplied by their severities to obtain the final lesion score for each area. Reported cases of lameness while the sows were in the farrowing crate were also recorded based on the individual sow cards. The association of lesion scores (< median vs. ≥ median) with lameness (lame or non-lame) was analyzed using multivariate logistic regression analysis (Proc logistic, SAS v 9.1). The lesion scores on different claw areas of lame and non-lame sows were compared using Kruskal-Wallis test (Proc npar1way). All analyses were performed using SAS (v 9.1). A *P* value of $\leq$ 0.05 was considered significant in all analyses.

Results

Table 1 presents the association of lesion scores (below median lesion scores vs. median and above median scores) in different claw areas with lameness (lame or non-lame).

Table 1: Odds ratios (OR) and confidence intervals (CI) showing the association of lameness (lame or non-lame) with lesions (below median lesion scores vs. median and above median scores) on different claw areas‡

Explanatory variables	OR and CI
Side wall	0.686 (0.462-1.016)
Heel	0.656 (0.458-0.940)*
Overgrown heel	1.186 (0.830-1.693)
White line	0.689 (0.480-0.990)*
Heel sole junction	0.837 (0.587 1.193)
Sole	0.860 (0.603-1.227)

* P <0.05; ‡ toe not included in the model since the median = 0.

Not all types of claw lesions were found to be associated with lameness (Table 1). Lesions on heel and white line were associated with lameness whereas overgrown heel, lesions at heel-sole

junction and sole lesions were not associated with lameness. Sows with below median heel lesion scores had 34% lower likelihood (P<0.05) of being lame. Similarly, sows with less severe (below median scores) white line lesions were also less likely (P<0.05) to be lame (OR 0.689). Sows with less severe side wall lesions tended to be (OR 0.686) to be non-lame (P = 0.06).

Table 2 compares the lesion scores on different claw areas in lame and non lame sows. The comparison of lesion scores indicated differences (P<0.05) between lame and non lame sows in terms of lesion scores on side wall and white line. Though not statistically significant, sole lesion scores also tended to be different between lame and non-lame sows (P=0.07).

Table 2: Comparison of lesion scores in lame and non-lame sows

Claw areas	Median and Range of lesion scores		P (Kruskal-wallis test)
	Lame	Non-lame	
Side wall	4 (0-12)	3 (0-14)	0.0138
Heel	3 (0-13)	3 (0-10)	0.2062
Overgrown heel	1 (0-8)	2 (0-12)	0.4678
White line	2 (0-11)	2 (0-14)	0.0208
Heel sole junction	1 (0-13)	0 (0-10)	0.1580
Sole	1 (0-9)	0.5 (0-8)	0.0676
Toe	0 (0-4)	0 (0-6)	0.4244

Discussion

Although sows with mild lesions may show no overt signs of pain, severe hoof lesions may be painful and cause lameness. A recent study has indicated that white line lesions were positively associated with lameness in breeding sows (Anil *et al*., 2007) which is in agreement with the present result. Other studies have also suggested claw lesions to be a major causative factor for lameness (Penny *et al*., 1963; Dewey *et al*., 1993).

The side wall of the claw and the sole consist of reinforced tubular horn, whereas the white line is the cemented junction of wall and sole and is considered to be a week point in the claw (Budras et al., 1996). Kempson and Logue (1993) based on bovine studies have indicated that injuries to the weak white line may easily penetrate the corium and facilitate spread of infection, causing lameness. Therefore, white line lesions are more likely to cause lameness than other

types of claw lesions. The present finding of lower odds of lameness in sows with < median scores for heel, white line and side wall lesions (Table 1) and finding of significant differences in lesion scores among lame and non-lame sows (Table 2) may add confirmation to the link between claw lesions and lameness. Based on the present study it may be concluded that minimizing claw lesions may reduce the incidence of lameness. Similarly, it is also important to prevent chances of upward infection through claw lesions to reduce incidence of lameness.

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