Periparturient lameness and lactation feed intake predict sow longevity

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Introduction

The longevity of female pigs is an important issue in swine breeding herds. Regardless of the removal reason, a low level of sow retention in the herd is a cause for both economic as well as welfare concerns. Breeding females are removed from the herd for production or health reasons. Herd productivity and sow longevity are related (Dourmad et al. 1994; Xue et al. 1997) as sow longevity influences the number of pigs produced per sow per year. The importance of the problem of poor longevity increases when the cause is associated with compromised welfare as it attracts wide criticisms from the public.

A sow may be removed from the herd either by culling or by death (including euthanasia). Reproductive inefficiency and health problems are the major reasons for sow removals. Although a sow may be removed from the herd at any point in time during its reproductive cycle, the risk of removal is not the same throughout its life. Farrowing is generally considered as a high risk event for removal for both production and welfare reasons. Stalder et al. (2004) summarized that farrowing problems accounted for 1.6 to 7.2% of all culling. The peripartum period is the risky period with 42% of all deaths occurring during this short period (Chagnon et al. 1991). In a Hungarian study, it has been reported that that 40.2% of mortality of sows happened during lactation (Karg and Bilkei, 2002). Among the factors that are associated with sow longevity that operate during the periparturient period, lactation feed intake (LFI) is an important one. Achieving maximum daily feed intake before the second week of lactation and having a maximum daily feed intake >8 kg has been suggested to lower the risk of mortality (Stalder et al., 2004). Anil et al. (2006) have reported that sows consuming $\leq$ 3.5 kg of feed per day during the first 2 wk of lactation were more likely to be removed from the herd before next parity. Locomotor problems (including lameness) are important reasons for health related removals. Among removed sows, 10 to 14 % of removals were reported to be due to locomotor problems (Stone, 1981; Friendship et al. 1986).

Given the impacts of a low level of sow retention it is important to minimize premature sow removals. Understanding the factors and their association with sow longevity would help producers to take efforts to improve sow longevity. The objective of the present study was to identify the risk factors operating at the periparturient period (i.e. while the females are in the farrowing crate prior to farrowing and including lactation) and their association with sow longevity (within 35 d post-farrowing or before subsequent farrowing).

Materials and methods

Data for this study were collected from a commercial swine breeding herd in the US Midwest during 2005-2006. Individual sow records as well as the PigCHAMP database (PigCHAMP, Ames, Iowa) of the herd were used for data collection. Information on incidence of lameness (prior to farrowing and during lactation), farrowing interventions (farrowing induction and farrowing assistance), lactation feed intake and lactation length were collected from the sow cards while the sows were in the farrowing crate. Sows were hand-fed daily using a standardized scoop while they were in the farrowing crate. Information on variables such as the parity of the sow, pre-weaning mortality, piglets born alive and piglets weaned, mummies, stillborn and sow longevity (removed or retained) were collected from the PigCHAMP database (PigCHAMP, Ames, Iowa) of the herd. The associations of the longevity of these sows 35 d post farrowing or before next parity with the data collected during the periparturient period were analyzed using multivariate logistic regression models (Proc logistic). Risk factors found associated ($P \leq 0.05$) with sow longevity in univariate analyses were only included in the multivariate models. For analysis, parity was categorized as parities 1 and 2, 3 to 5 and > 5. Lameness was categorized as lame or non-lame. Factors such as farrowing induction and farrowing assistance were categorized as induced or not and as assisted or not respectively. Mummies, stillborn and preweaning piglet mortality were categorized as present or absent. Lactation length, average lactation feed intake (LFI) and piglets born alive and piglets weaned were included in the model as continuous variables. The average LFI for each sow was calculated by dividing the quantity of feed consumed from day 1 of lactation until weaning by the number of lactation days for that sow. All analyses were performed using SAS (SAS Inst, Inc. 2003) (v 9.1). A *P* value of ≤ 0.05 was considered significant in all analyses.

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64 **Results**

65 Data pertaining to 1357 sows were collected. A description of the data collected is presented in

66 Table 1.

67 Table 1: Description of data (number of sows = 1357)

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Variable	Number / mean ± SE
Sows with reported lameness	176
Number of sows removed within 35 days of farrowing	77
Number of sows removed before next parity	269
Sows with assisted farrowings	1195
Sows with induced farrowing	991
Sows with stillborn piglets	580
Sows with mummies	477
Sows with reported pre-weaning mortality	711
Average lactation feed intake (kg) (mean ± SE)	8.06 ± 0.01
Lactation length (days) (mean ± SE)	20.67± 0.06
Number of piglets born alive (mean ± SE)	10.52 ± 0.07
Average parity (mean ± SE)	4.12 ± 0.06

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70 Factors such as farrowing interventions (farrowing induction and farrowing assistance) and

71 presence of stillborn, mummies and preweaning piglet mortality and number of piglets weaned

72 were not associated with sow longevity within 35 d post farrowing based on the univariate

73 analyses($P>0.05$). The results (Table 2) indicated that the likelihood of removal from the herd

74 within 35 d post-farrowing were associated with the number of piglets born alive, average LFI,

75 lameness and parity ($P<0.05$ for all).

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77 Table 2: Odds ratios and confidence intervals of risk factors associated with sow longevity

78 within 35 d post-farrowing or before next parity

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Risk factors	35 d post farrowing		Before next parity	
	Odds ratio	Confidence interval	Odds ratio	Confidence interval
Piglets born alive	0.813^{***}	0.745 – 0.887	0.916^{**}	0.869 – 0.965
Average LFI	0.656^{*}	0.454 – 0.947	0.827^{NS}	0.670 – 1.022
Non lame vs. lame	0.260^{***}	0.147 – 0.461	0.626^{*}	0.430 – 0.912

Parity 1 &2 vs. >5	0.181***	0.082 – 0.397	0.548**	0.377 – 0.795
Parity 3 to 5 vs. >5	0.285***	0.163 – 0.498	0.558***	0.407 – 0.765

NS – not significant; *** <0.001; ** <0.01; * <0.05

The likelihood of removal from the herd within 35 days of farrowing decreased by approximately 19% with every additional piglet born alive and 34 % with every additional kg increase in average LFI (P<0.05 for both). Non-lame sows were 74% less (P<0.05) likely to be removed from the herd within 35 d post farrowing compared to lame sows. Sows of parity 1 and 2, and 3 to 5 were less likely (odds ratios 0.18 and 0.29 respectively) to be removed from the herd compared to sows of parity >5 (P<0.05 for both). Average LFI was not found to be associated with sow longevity before next parity in the multivariate model (P>0.05). A lesser number of piglets born alive and lameness appeared to adversely affect (P<0.05) sow longevity before next farrowing (Odds ratios 0.92 and 0.63 respectively). Sows of parity 1 and 2 (odds ratio 0.55) and parity 3 to 5 (odds ratio 0.56) were less (P<0.05) likely to be removed from the herd before next farrowing compared to sows of parity >5.

Discussion

The number of piglets born alive is a highly preferred performance variable in swine breeding herds because of its influence on the herd output and on the cost per piglet produced. Therefore, it is likely that a sow yielding a higher number of live born piglets may be retained in the herd, as evident from the negative relationship between sow longevity (within 35 d post farrowing or before next parity) and number of live born piglets observed in this study. Locomotor problems have been reported to be a major reason for sow culling (Jørgensen, 2000). Therefore, the present results are in agreement with the previous studies on the importance of locomotor problems as the reason for sow removals. Locomotor problems during the periparturient period such as lameness may affect sow longevity in more than one way. Lameness is a known painful condition and pain may reduce feed intake. Johnson (1997) has reported that cytokines (interleukin-1, interleukin-6 and tumor necrosis factor-alpha) released by the inflammatory process can induce anorexia and lethargy. Inadequate LFI has been reported to affect subsequent reproductive performance of the sow (Baidoo et al. 1992; Kirkwood et al. 1987) leading to a

removal from the herd. The effects of inadequate lactation feed intake include longer wean to estrus interval (Baidoo et al. 1992) and lower pregnancy rate and embryo survival (Kirkwood et al. 1987). As reproductive inefficiency is the most important reason for sow removals in breeding herds (Stalder et al. 2004), effects of low LFI may reduce sow longevity. Thus, the association of a lower likelihood of sow removals within 35 d post-farrowing with a higher average LFI in the present study (Table 2) agrees with earlier reports on lactation feeding and sow longevity. The risk of mortality increases with parity (Deen and Xue, 1999; Koketsu, 2000; Tiranti et al., 2003). The present observation of higher risk of removal for older sows is thus in agreement with the previous reports. The present study indicated that periparturient factors such as lactation feed intake, incidence of lameness as well as sow level factors such as higher parity and lesser number of piglets born alive predict the removal of a sow from the breeding herd.

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