Pre-mating conditions, related with sow metabolic state, affect piglet birth weight uniformity

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Introduction

Two important factors affecting piglet survival are piglet birth weight and piglet uniformity (Milligan et al. 2002). Both piglet birth weight and uniformity are related with litter size and parity (Milligan et al. 2002, Wientjes et al. 2012c), but other factors are poorly described. Pre-mating nutrition, i.e. feed intake and feed composition, can affect development and uniformity of foetuses (Ferguson et al. 2006) and piglets at birth (Van den Brand et al. 2006, 2009). Insulin and IGF-1 seem to be potential mediators, probably through their beneficial effects on follicle development (as reviewed by e.g. Quesnel (2009)) and subsequent embryo and luteal development (Wientjes et al. 2012 a,b). Pre-mating conditions which affect sow metabolic state before mating, and thereby follicle development, may thus be important for subsequent piglet birth weight and uniformity.

Therefore, our aim was to study effects of factors related with sow metabolic state before mating, such as length of the weaning-to-insemination interval (WII), and lactational body weight and backfat losses, on subsequent litter characteristics at birth, with focus on piglet birth weight and uniformity.

Material and Methods

At the IPG research farm, litter characteristics (total number born, litter weight at birth, mean piglet birth weight, SD of birth weight, CV of birth weight) of sows with a WII ≤ 7d, that farrowed from first insemination cycle after weaning (excluding repeat breeders), and with > 4 total born piglets (n = 1,584) was measured and analysed using the MIXED procedure of SAS 9.2. The statistical model included parity (1, 2, 3 + 4, ≥ 5), crossbreed (TOPIGS20, TOPIGS40), the interaction between parity and crossbreed, and either lactational body weight loss (≤ 3.5%, 3.5 – 13.5%, > 13.5%) or backfat loss (≤ 2 mm, 2 – 5 mm, > 5 mm), and its interactions with parity and crossbreed as fixed factors, and the factors sow and farrowing batch as random effects. For mean birth weight, SD and CV of birth weight, the number of total born piglets was added as additional covariate.

In a separate dataset, litter characteristics of sows with a WII of 8 - 21d and a WII > 21d (incl. repeat breeders) was compared with sows having a WII ≤ 7d, using the same model.

Results and Discussion

Litter size was higher for sows with a prolonged WII (14.9 and 14.4 piglets for sows with a WII of 8 - 21d and > 21d, incl. repeat breeders, respectively) compared with sows with a WII ≤ 7d (13.7 piglets; Table 1). Litter weight at birth was higher for sows with a 8-21d WII (20.2 kg) compared with sows with a WII ≤ 7d (19.3 kg; Table 1). Mean birth weight was not affected by the length of the WII. The SD and CV of birth weight were lower in sows with a WII > 21d (incl. repeat breeders) compared with sows with a WII ≤ 7d (Table 1).

Litter size, litter weight at birth and mean piglet birth weight were not affected by lactational body weight or backfat losses. Only in TOPIGS20 sows, SD of birth weight increased with lactational body weight losses (SD was 279, 299 and 307g ($P = 0.02$), for sows with body weight losses of ≤ 3.5%, 3.5 – 13.5%, and > 13.5%, respectively) and backfat losses (SD was 285, 297 and 310g ($P = 0.04$), for sows with backfat losses of ≤ 2 mm, 2 – 5 mm, and > 5 mm, respectively) and CV of birth weight increased with lactational backfat losses (CV was 20.6, 21.6 and 22.4% ($P = 0.05$), for sows with backfat losses of ≤ 2 mm, 2 – 5 mm, and > 5 mm, respectively).

We conclude that pre-mating conditions, related with sow metabolic state, can affect subsequent litter characteristics at birth. A prolonged WII, i.e. a recovery period after weaning, seems beneficial for

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subsequent litter sizes and piglet uniformity. Severe body weight and backfat losses during lactation may have negative consequences for subsequent piglet uniformity, although consequences may differ between breeds.

Table 1. Effect of prolonged weaning-to-insemination interval (WII) or repeat breeders on litter characteristics of total born piglets at birth (LSmeans ± SEM).

	WII ≤ 7d	WII 8-21d	WII >21 d + repeat breeders	SEM	P-value
Number of litters, n	1584	72	182		
Total number born, n	13.7^{a}	14.9^{b}	14.4^{b}	0.3	< 0.01
Litter weight at birth, kg	19.3^{a}	20.2^{b}	19.9^{ab}	0.3	< 0.01
Mean birth weight[1], g	1428	1438	1431	17	0.83
SD of birth weight[1], g	310^{b}	291^{ab}	287^{a}	7	< 0.01
CV of birth weight[1], %	22.2^{b}	20.8^{ab}	20.5^{a}	0.5	< 0.01

Within rows, values lacking a common superscript differ (P ≤ 0.05).

[1] Corrected for the effect of litter size (total born). When not corrected for litter size, LSmeans for WII ≤ 7d, WII 8-21d and WII > 21d + repeat breeders were 1438, 1398 and 1416 g respectively, for mean birth weight (P = 0.12), 308^{b}, 295^{ab}, 289^{a} g respectively, for SD of birth weight (P < 0.01), and 22.0, 21.7 and 21.0% respectively, for CV of birth weight (P = 0.14).

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