Annual meeting 2007, Dublin, Ireland
Session P26 – poster 16

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A comparison of vitality and growth performance before weaning of crossbred piglets obtained from Pietrain or crossbred Large White x Pietrain boars and Large White x Landrace sows

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INTRODUCTION

Over the last decades, increased litter size impacted on litter's characteristics at birth. An increment of heterogeneity was especially observed by Canario (2006). This was associated with an increased number of small piglets, whose survival rate is reduced (Quiniou et al., 2002; Mesa et al., 2006). Now, improving newborn piglets' viability is of major interest in order to get more advantages from hyper prolificacy. Semen demand from pure Pietrain boars has been increasing dramatically in France since 1999 to reach 54% of doses sold by artificial insemination centres in 2006 (vs. 7% in 1999). Recent increase of utilisation of Pietrain boars was motivated by economical considerations (leaner carcasses, better feed efficiency). Although scientific evidence is still lacking (Rose et al., 2004), Pietrain sires are also preferred due to their expected better resistance to the PCV2 virus involved in post weaning multisystemic wasting syndrome (PMWS). This change raised questions about possible negative impacts of Pietrain sires on piglets' vitality at birth and survival. This trial was designed to investigate the consequences of the use of Pietrain semen on gestation length, farrowing durations and characteristics of the neonates (weights, growth rates, vitality survival, pathologies…).

MATERIAL AND METHODS

Experimental design

Four batches of 24 crossbred Large White × Landrace sows were used to quantify the effect of type of service sires on farrowing and lactation performance. Within each batch, sows were artificially inseminated either with semen from pure Pietrain boars (group PP) homozygote halothane reacting pigs or crossbred Large × Pietrain boars (group LW×PP). For each group, 31 different sires were used. Sows were allocated to one of the two types of boars, depending on parity and body condition assessed from their body weight and their backfat thickness (BT). The PCV2 serology was also taken into account (results not presented here).

Experimental conditions

Pregnant and lactating sows from both groups were submitted to the same feeding plan. During gestation, feed allowance was adapted to body condition at mating. Feeding level was restricted during the first five days of lactation and thereafter sows were fed ad libitum. Net energy content was 9.21 and 9.80 MJ per kg during gestation and lactation, respectively. Corresponding values for digestible lysine content were 5.1 and 8.5 g per kg. Creep feed was offered to piglets from the 11th day of life onwards.

During farrowing, an infrared lamp was switched on at the bottom of the sow. An additional lamp was also used beside the sow from farrowing until the following Monday morning. Farrowing was not induced and birth supervision was limited. Assistance was provided only for piglets being crushed and for sows in case of farrowing difficulties. Routine interventions; teeth grinding, tail cutting, umbilical disinfection, iron injection, were performed one to twelve hours after the birth of the last piglet. Low birth weight piglets (less than 1.2 kg) were fed once with a commercial nutritional complement. Cross fostering were realised within 12-24 h post-farrowing, with both dam and nurse being from the same group. Males were castrated around 5-6 days of age, and received antibiotics.

Measurements

Piglets were weighed within 24 h post-farrowing and at weaning at 28 d of age. Video recordings were used to detect the beginning and the end of each farrowing. Number of piglets born alive or stillborn was noted. Piglets that died before weaning were weighed and the day was noted. Technicians, with special attention to splay leg or tremor syndromes and lameness, checked legs' quality routinely.

Calculations and statistical analyses

Gestation duration was calculated as the difference between the day and hour at the beginning of the farrowing and the day and hour of the first artificial insemination. Farrowing duration was the time elapsed between the birth of the last and the first piglets. This criterion was analysed after a Boxcox transformation (proc TRANSREG, SAS, 1990, Canario, 2006) with the type of boar, the batch and the need for assistance as main effects. Stillbirth rate or post-farrowing losses within or after the first 24 hours of life were either calculated on average for each sow or on a troop level. The Chi-square test (Chi²) was used to investigate the boar effect on rates of losses. Variance analyses (proc GLM, SAS, 1990) were used to study other criteria with the type of boar (T), the batch (B) and parity (P) as main effects. Parity was categorized in five classes: 1, 2, 3 and 4, 5 and 6, 7 and more. For lactation performance, litter size was introduced in the model as covariate.

RESULTS AND DISCUSSION

In both groups, sows weighed 274 kg on average after farrowing and their BT averaged 20.3 mm. No difference was observed during gestation on variation of these criteria. During lactation, body weight and BT losses averaged 28 kg and 3.6 mm in both groups, respectively.

Gestation and farrowing durations

Time at the beginning or at the end of farrowing was not available for some sows. Gestation duration averaged 114.3 d and was not significantly influenced by the type of boar (Table 1). This is in agreement with Sellier et al. (1999) who reported a 114.2 d-long gestation in LW sows inseminated with semen from LW or PP boars. As previously indicated by Aumaître et al. (1979), gestation duration was significantly correlated to litter size ($r = -0.42$, $P<0.001$) and litter's characteristics (total weight: $r = -0.33$, $P<0.01$; individual weight: $r = 0.36$, $P<0.001$). However, pregnancy duration was not specifically reduced among large litters. Only small litters with 10 piglets or less significantly prolonged pregnancy.

When more than six piglets were manually extracted or when time interval between the two last piglets was higher than 5 hours, farrowing duration was not taken into account. However, removing or not these litters did not modify the boar type effect, which was not significant (Table 1). Farrowing duration averaged 5.0 h in both groups. This value is higher than duration observed in a previous trial carried out from the same herd but from younger sows (Quiniou, 2005). Birth interval averaged 25 minutes in both groups and was not different among litters born with or without assistance. The biggest was the litter, the shortest was the average birth interval between two piglets ($r = -0.49$, $P<0.001$), in agreement with results published by Canario (2006). Thereafter, farrowing duration correlation with litter size was rather limited ($r = 0.24$, $P<0.05$).

Litter size averaged 13.7 piglets in both groups, which was coherent with a small effect of type of boar on this criterion as shown by van der Lende et al. (1999), Chen et al. (2003) and Hamann et al. (2003). In both groups, total born piglets weighed 1.57 kg on average at birth and heterogeneity of individual weights within the litter was similar (±0.33 kg). Proportion of piglets weighing 20% less than the average birth weight of their littermates was 18% in both groups.

Table 1: Performances at birth and during lactation

Type of boar	PP	LW×PP	RSD[1]	Statistics
Gestation (no.)[2]	*(43)*	*(42)*		
Duration, d	114.2	114.4	1.5	S***
Farrowing [3]	*(36)*	*(41)*		
Duration, h	4.9	5.0		-
Mean interval between piglets, min	23	27		-
Litters' characteristics at birth (no.)[4]	*(46)*	*(47)*		
Parity	3.8	3.8	2.5	-
Total born piglets	13.7	13.7	3.5	P**
Born alive piglets	12.5	12.7	3.1	-
Mean birth weight				
kg/litter	20.9	20.6	4.4	P**
kg/piglet	1.57	1.56	0.27	P*
Standard error within litter, kg	0.33	0.34	0.08	P*
Lactation performance (no.)[5]	*(44)*	*(46)*		
Litter size at weaning	10.6	10.8	2.0	-
Mean weight at weaning				
kg/litter	95.4	97.2	10.5	S***
kg/piglet	9.1	9.1	1.0	S***
Average daily gain, kg/d/litter	2.86	2.94	0.33	S***

1. Residual standard deviation.
2. no.: number of observations.
3. Analysis after a Boxcox transformation (see the text).
4. Variance analysis with the type of boar (P>0.10 for all criteria), the batch, and the parity (P) as main effects.
5. Average litter size (S) during lactation was introduced as a covariate in the model.

Survival rate

Literature papers that focus on the effect of the type of boar on piglets' survival are scarce but all of them agree on a limited impact when compared to the sow's effect. In the present study, mortality per litter did not differ among boars. Calculation on a troop basis (Table 2) indicates that stillbirth rate was comparable in both groups (9 and 7% in PP and LW×PP groups, respectively). Such a result is coherent with the small difference in stillbirth rate between European breeds (Canario, 2006).

Within the first 24 h post-farrowing, losses were significantly higher in PP group (8 vs 5% of born alive piglets in LW×PP, Table 2). This confirms pig producers' statements collected by Larour et al. (2005) in piggeries that recently changed for PP boars. Increased early losses in PP group were not sufficient to result in a significant difference in total losses before weaning. This contrasts with higher birth to weaning losses monitored among pure PP pigs by comparison with pure LW (Canario, 2006). Our results may be explained by a heterosis benefit on post-natal losses.

Tableau 2: Number of piglet and losses before weaning

Type of boar	PP	LW×PP	Chi² test
At birth			
Number of litters	46	47	
Number of total born piglets (TB)	632	643	
Stillborn piglets, % TB	8.7	7.2	ns
Number of born alive piglets (BA)	577	597	
Losses before 24 h of life, % BA	8.1	5.2	*
During lactation			
Number of litters	44	46	
Number of alive piglets at 24 h (A24)	514	561	
Losses before weaning, % A24	9.1	9.8	ns
Total losses, % TB	23.2	20.4	ns

Locomotion problems

Proportion of piglets born alive and uncrushed at birth that exhibited tremor syndrome tended to be higher in PP group (Table 3). In addition, lameness occurrence was higher in this group (P<0.01). Cumulated problems of splay leg and lameness concerned 15% of born alive and uncrushed piglet from the PP group versus 9% in LW×PP group (P<0.01). In contrast with Larour et al. (2005), splay leg occurrence was not higher in PP group. This can be related with the similar litter size and gestation duration in both groups. The obtained value (4%) is slightly higher than the one reported by Sellier et al. (1999). According to their study with LW sows, splay leg rate was 3.5 and 2.4% with PP and LW boars, respectively, but litter size was smaller in the latter group (-0.5 piglet, P>0.10).

Table 3: Status of piglets with regard to locomotion

Type of boar	PP	LW×PP	Chi² test
Number of uncrushed piglets at birth	577	582	
Tremor syndrome, %	2.6	1.2	P=0.08
Locomotion problems, %[1]	14.9	8.8	***
Splay leg, %	4.2	3.6	ns
Lameness, %[2]	9.4	4.5	**

1. At least one problem, including those induced by crushing.
2. Excluding those due to crushing.

In the present trial, major part of locomotion problems was linked to lameness. Eighty percent of problems were due to infectious lameness, especially whitlow or arthritis. Neither their respective contributions nor their intensities were quantified. In literature, the impact of genetic selection on resistance to some pathogens has been demonstrated but nothing was reported on sensitivity to infectious lameness (Roher and Beattie, 1999). According to Henryon et al. (2001), differences in frequency of locomotion problems are observed among pure breeds during the growing-fattening period, but PP pigs were not studied in their trial. Over this body weight range, lameness probably results from difference in physical conformation rather than in sensitivity to infections. Then, it appears difficult to conclude to a difference among breeds about sensitivity to infectious lameness before weaning.

Lactation performances

As presented in Table 1, litter size at weaning was similar in both groups. Despite more frequent locomotion problems in PP group, weaning weight averaged 9.1 kg like in LW×PP group. It corresponded to an average daily gain (ADG) of 2.9 kg/d per litter in both groups. Lameness was associated with a reduction in ADG. In PP group, ADG of healthy piglet was 275 vs. 230 g/d when lameness was observed. Corresponding values were 271 vs. 236 g/d in LW×PP group. Lameness was associated with difficulties to get similar amount of milk as piglets without problem. However, litters' ADG is essentially limited by the milking capacity of the sow. Subsequently, ADG in PP group would not probably have exceeded the observed value even when less locomotion problems.

CONCLUSION

According to the present study, gestation duration was not different when pure PP or crossbred LW×PP boars were used as service sires. Then, changing the type of sire from LWxPP to PP does not imply any change in farrowing induction schedule. Induction would even be more interesting with PP semen as a more intensive supervision is required to prevent peri-partum losses. Indeed, with limited farrowing supervision, more frequent early losses were observed with PP boars. The difference was not sufficient to compromise significantly the litter size at weaning in our experimental conditions. However, such results were obtained with optimal housing and feeding practices… Thereafter, in commercial piggeries a more intensive supervision around birth may be recommended when sows are inseminated with semen from pure PP boars. With regard to a similar gestation duration and litter size at birth, splayleg piglets were in the same proportion with PP and LW×PP boars. The possible impact of PP boars on early locomotor problems needs further investigations.

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ABSTRACT

A trial was carried out to compare gestation length (without farrowing induction), farrowing and lactation progress when sows were artificially inseminated with semen from either Yorkshire x Pietrain crossbred sires (LWxPP group) or purebred Pietrain ones (PP group) homozygote halothane reacting pigs. Sows were allocated to one of both types of sires, depending on their parity and body condition. Gestation length averaged 114.3 days and farrowing 5.0 hours on average, whichever the sire concerned. Stillbirth rate did not differ among type of boars (7 and 9% in treatments LWxPP and PP, respectively). Losses over the first 24 hours of life were higher in piglets from PP sire (8 vs. 5% in LWxPP, $P<0.05$) but the difference was not high enough to induce a significant difference on litter size at weaning (10.9 piglets on average). Growth rate averaged 270 g/d/piglet for both treatments. Proportion of splay leg piglets was not higher with PP sire but piglets seemed to be more sensitive to infectious lameness (15 vs 9% of born alive and uncrushed piglets). Estimation for genetic sensitivity to these pathologies needs to be more specifically studied. According to present results, changing the sire's breed from LWxPP to PP does not imply any change in farrowing induction schedule. Induction would even be more interesting with PP semen as a more intensive supervision is required to prevent from peri-partum losses.