Management of High Prolificacy in French Herds: Can We Alleviate Side Effects on Piglet Survival?

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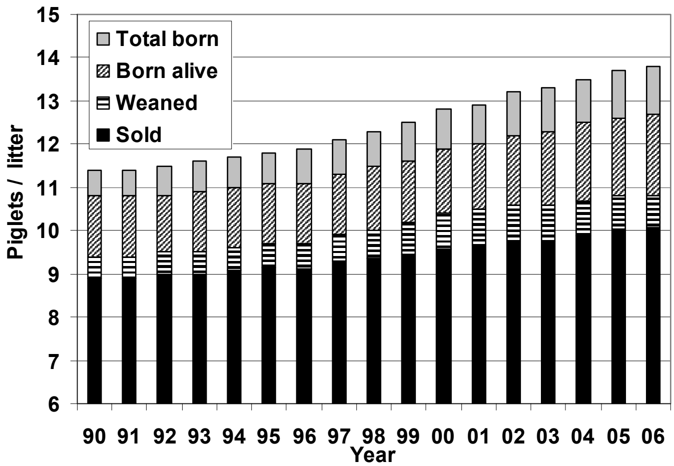
▪ Introduction

In general the development of hyper prolific sows has been associated with a dramatic increase in perinatal mortality. Analysis of the performance of French sow herds (IFIP, 2007) indicates that total number of piglets born per litter increased from 11.9 in 1996 to 13.8 in 2006. Simultaneously, total mortality increased from less than 19% up to 21%, with about 25% of herds losing more than 25% of piglets born before weaning (Badouard, personal communication). Stillborn piglets (8% of total born) presently account for about 40% of total mortality. With 12.7 born alive per litter, mortality frequently reaches 15% during lactation, mainly due to crushing of starved and weak piglets. However, the size of weaned litters and sow productivity are still increasing with prolificacy (**Figure 1**), without an apparent negative impact on sow fertility or longevity (Boulot, 2004). In 2006, the 10% most efficient French farms (n=280) weaned 30 piglets/productive sow /year, with 14.3 total born per litter and only 17.3% total piglet losses. That may represent a somewhat optimistic perception of prolificacy, despite negative ethical impacts and economic wastes.

“High prolificacy is more a chance than a risk!” This was one of the conclusions of a 2007 pig producers’ seminar dedicated to “Strategies to wean 12”. Many questions required practical answers.

- What are the side effects of high prolificacy in French herds?
- Is it possible to prevent or alleviate them by improving birth weight, viability or litter uniformity?
- If not, what are the most efficient strategies at farm level?

Figure 1. Evolution of litter size in French sow herds (IFIP-Institut du Porc, National GTTT data bank).



Consequences on Piglets and Litters

Mean birth weight and litter uniformity

Recently, Quiniou et al. (2007a) described the association between litter size and heterogeneity in hyperprolific LWxLR experimental IFIP's herd. When litter size increased from less than 10 piglets to more than 15, mean birth weight (BW) was reduced by 500 g. Variability was high with a coefficient of variation (CV) increasing from 15 to about 24% (**Table 1**). Consequently, the proportion of piglets weighing less than 1 kg increased from 3 to 15% (Table 1). it is still debatable whether these small piglets have a higher risk of being stillborn but they clearly have a lower survival rate than their heavier littermates.

In IFIP's herd, for example, the pre-weaning survival rate averages 70%, vs 90% for piglets weighing more than 1.4 kg at birth (Quiniou et al., 2002). In large litters, BW heterogeneity is an additional risk factor for pre-weaning mortality (Milligan et al., 2002). If they survive, these under-weight piglets will consistently have poorer growth performance before and after weaning, with subsequent complications of slaughter management due to large within-batch variations of final weights (IFIP, 2005). Large litters are also characterized as having a reduced proportion of heavy piglets, whose probability of survival is good. In the IFIP's herd, most piglets weigh more than 1.4 kg at birth in small litters, whereas the proportion of pigs > 1.4 kg falls below 50% in litters of 16 piglets and more (Table 1). The increased occurrence of litters with a high proportion of less viable piglets explains, at least in part, higher preweaning mortality.

Table 1. Effect of litter size on piglet BW variation (1380 litters born from 2000 to 2004).

Litter size (class)	≤ 9	10-11	12-13	14-15	≥ 16
Mean parity	2.6	2.3	2.5	2.6	3.5
Litter					
n	161	134	245	334	506
No. total born	7.2	10.6	12.6	14.5	17.6
No. born alive	7.0	10.2	11.9	13.8	16.2
No. stillborn	0.3	0.4	0.6	0.7	1.5
Mean BW, kg	1.89^{a}	1.67^{b}	1.57^{c}	1.47^{d}	1.38^{e}
CV_{BW}, %	14.9^{d}	17.4^{c}	20.2^{b}	21.3^{b}	23.7^{a}
Distribution in BW classes, %					
< 1.0 kg	3^{e}	5^{d}	8^{c}	10^{b}	15^{a}
1-1.4 kg	8^{e}	16^{d}	21^{c}	29^{b}	34^{a}
1.4-1.8 kg	27^{c}	39^{b}	43^{a}	43^{a}	38^{b}
> 1.8 kg	63^{a}	40^{b}	28^{c}	19d	13^{e}

[a,b,c,d,e] Within each row, means with no common superscript differ ($P < 0.05$).

Immunity and colostrum intake

Because energy stores and immune protection of the newborn piglet are poor, colostrum consumption is essential for survival. Devillers (2004) showed that piglets that died early were lighter at birth (1.0 vs. 1.3 kg) and had consumed less colostrum within 24 h after birth (72 vs. 326 g) than piglets still alive at weaning. Subsequently, these small piglets have lower ability to control thermoregulation. They are generally less vigorous and less able to compete with larger littermates for teat access, and experience a delay between birth and first suckling. Besides piglet BW, litter size also influences colostrum intake. Unlike milk production, colostrum yield hardly increases with litter size (Devillers, 2004). Therefore, colostrum availability for each piglet is reduced in large litters. Small piglets are particularly disadvantaged in large and heterogeneous litters, where pig number generally exceeds teat number.

▪ Specific Strategies to be Implemented at Farm Level

Techniques which may reduce stillbirths and enhance neonate survival have been extensively reviewed. IFIP's inventory consists in 10 key points and not less than 100 technical proposals! Priorities may vary according to farms and can be investigated with mortality checkup grids. Successful managers of large litters avoid practices that may amplify detrimental effects of low BW (anticipated or lengthened farrowings, low ambient temperatures, low colostrum intake, competition for teats, etc). According to field studies (IFIP, 2005) these managers concentrate on best practices, with a special attention paid to birth and neonatal supervision, specific care of weak and supernumerary piglets and promotion of the sow's health and high milk production.

Pregnancy and farrowing induction

Because fetal growth rate is high during the last weeks of gestation, it is expected that extended gestations would improve BW and piglet viability. Farrowing at 112 days or less, increases stillborn piglets (Sasaki and Koketsu, 2007) and may alter colostrum production (Devillers, 2004). In fact, gestation length varies within narrow limits and is difficult to manage. Nevertheless, about 5% of French herds occasionally use altrenogest to prevent premature farrowing before 112 days, and about 15% of herds recently stopped induction (Boulot, unpublished survey). However, hormonal induction of farrowing is common (77% farms), with high frequencies in prolific herds. Our data suggest that in many cases inadequate practices or imprecise calculation of gestation length may account for premature induction. Adequate practices - based on individual monitoring of expected farrowing time - will have numerous positive effects through more efficient supervision, if less night-time or week-end births occur.

Farrowing supervision

The benefit of farrowing supervision has been regularly demonstrated, and becomes a priority in hyperprolific herds (Le Cozler et al., 2002). Early management of surplus or weak piglets and within-batch litter standardizations are easier with grouped parturitions over short periods. Despite a reduction of birth intervals with large litter sizes (Canario et al., 2007b), total parturition may exceed 5 hours, with subsequent risks of more intra-partum deaths, and weak or anoxic piglets. Prevention of excessive farrowing durations relies upon limitation of problems in sows (fatness, constipation, age, urogenital troubles). Efficient interventions include manual extraction of piglets on target sows (old animals, on the morning after night deliveries, or slow parturitions). Immediate drying and warming of the neonate is essential. Pharmacological assistance is frequent among French herds, including injections of calcium, vetrabutin, oxytocin or carbetocin. However, use of low doses and close supervision are required to limit detrimental effects on umbilical cords (Boulot et al., 2006). However, assistance is somehow complicated in modern sows, as they farrow more frequently outside the working hours (Canario et al. 2007a). In cases of unattended farrowings, more emphasis will be put on adequate piglet thermal environment, the design of farrowing crates and maternal behavior .

Perinatal management of piglets and sows

More assistance to the weakest over the first 48 hours of life dramatically increases their survival. This may include delivery of energy rich pastes or preserved colostrum, alternate or supervised nursing, re-hydratation, and prevention of crushing during sow meals (IFIP, 2005). Because nursed litter sizes must not exceed functional teat numbers (14 to 16), early litter standardization is necessary either by weight or by numbers. However, piglets should not be moved before they have suckled their dam's colostrum (6 hours). PCV2 control procedures also advise a limitation of exchanges within and between batches, and after the first week. Despite possible negative sanitary impacts, one-step or two-step nurses are common and very efficient for saving piglets (Thorup and Sorensen 2006). Early weaning of surplus piglets is restricted by EU regulations and is scarce. Although « 4 week weaning » is still the dominant strategy, lactation length is steadily decreasing, with 23% herds and about 40% piglets now being weaned at 3 weeks (Badouard, personal comm.). This choice may be partly linked to preservation of the sows' body condition and reproductive performance. Early feed supplementation for piglets and prevention of infections (hygiene, vaccines) is also a priority because of poor immune status of small piglets and specific sensitivities of some genetic lines (Quiniou et al., 2007b).

All these strategies are economically rewarding but they require more qualified staff and are time consuming: +1.5 h / sow during the farrowing week in French batch management systems

Adaptations of feeding strategy

Selection for hyperprolificacy resulted in increased nutrient requirements during lactation. Simultaneously, the selection for reduced carcass fatness in growing pigs limits increased appetite of the sows. Even if increases in feed supply after farrowing are implemented more rapidly than 15 years ago (EDE 1995) and the level of amino acids in lactation diets is more finely adjusted to milk potential and feed intake, a dramatic deterioration in the nutritional balance of lactating sows with large litters is observed. In most cases, nutrient deficiency is compensated by body reserve mobilization. During the following gestation, particular attention is then paid by farmers to repletion of body condition through an adjustment of gestation feeding level to the body condition score or backfat thickness (BF) at weaning.

Feeding management of pregnant and lactating sows now requires greater attention in hyperprolific herds. In most sow herds, average feed allowance over the 114 days of gestation is adjusted to the sow's BF and parity. The aim is to reduce heterogeneity among sows at farrowing. Indeed, increasing heterogeneity of BF in a given herd is associated with a higher percentage of stillborn piglets (unpublished results), associated with complicated parturitions of too fat or too weak sows.

More attention is also paid to the kinetics of feed supply during gestation. According to Noblet et al. (1985), the nutrient deposition in the conceptus increases markedly during the last weeks of gestation. With 14-15 total born piglets, available nutrients for the conceptus may be lacking during the last weeks of gestation if the feed allowance is not adjusted. Consequently for a similar total feed allowance over 114 days of gestation, two feeding plans were compared by (Quiniou, 2005). HIGH sows received around 900 g/d more feed than LOW sows during the last 14 days The average piglet BW did not differ among treatments but farrowing was easier for HIGH sows and piglets were more vigorous, as indicated by higher proportion of those that reached the teat within the first hours of life. Therefore, feed supply is presently increased during the last weeks of gestation in most French hyperprolific herds. Replacement of some part of starch by lipid (5% in the diet) as sources of energy during gestation also provided some interesting perspectives in terms of piglets viability. However, lipid supply must start early enough to influence the fetuses' characteristics, i.e. from the beginning of the 2nd month of gestation (Quiniou et al., 2006).

▪ Conclusions

Despite a considerable amount of research, poor piglet survival slows down the progress expected from the move towards sow hyper prolificacy. Although very few management procedures may directly improve piglet quality, specific strategies may be implemented at farm level that will partly compensate side effects of large litters, before and after weaning. According to economic simulations, 0.85 kg is the minimum limit to save piglets from modern genotypes (IFIP, 2005). French solutions are time consuming and may be less efficient without batch management. However, things may change favorably in the near future due to re-orientation of selection objectives. Since 2002, born alive instead of total-born, and functional teat numbers, are included in LW and LR French breeding programs. The addition of new components of maternal ability such as sow behavior, farrowing quality, colostrum production, and piglet weight, vitality or growth rate, may also improve survival and reduce the demand for human intervention.

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