# EFFECTS OF UNIFORMITY OF LITTER 24H POST-FARROWING ON MORTALITY AND GROWTH OF THE PIGLETS

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## INTRODUCTION

Pre-weaning mortality of piglets has an important impact in sow productivity and represents a welfare problem (Le Dividich and Rooke, 2006). In the same work authors highlight that concomitantly to the litter size increase from 1995 to 2004 there was also an increase in total pre-weaning mortality from 17-18% to 21-23%. More recent data from 2015 in France (IFIP-GTTT, 2018) show a total mortality rate of 20% and 13% for born alive piglets indicating that the advances in this area are small. Regarding live born piglets, most of the losses occur within the first days (3-4) post-farrowing (Decaluwé *et al*., 2014; Galiot *et al*., 2018) with the first day having a significant part of the deaths (Marchant *et al*., 2000; Casellas *et al*., 2004). This mortality can be related to increased prolificacy, higher within litter weight variability and higher number of low birth weight piglets (Quesnel *et al*., 2008) with negative impacts on colostrum intake (CI) in the first hours after birth, which is crucial for survival regarding the newborn piglet immune and energetic status at birth (Quesnel *et al*., 2012). It is estimated that to significantly reduce the mortality risk, each piglet should consume about 200g of colostrum in the first 24h of live (Quesnel *et al*., 2012), however, the within litter variation of CI is quite variable (averaging 40%, Le Dividich *et al*., 2005) depending on sow, piglet and litter characteristics. In pig farms, the cross-fostering is a common practice in order to adequate the litter size to the sow capacity (e.g. number of functional teats) and to reduce within litter weight variation and, as a final goal, to reduce pre-weaning mortality. In a previous

study of our team (Charneca *et al*., 2013) where cross-fostering was made right after birth and uniform and heterogeneous litters were made, there was a significant reduction of pre-weaning mortality rate on uniform litters compared to the heterogeneous ones (6,4% vs 11,9%). However, at farms level due to management practical constraints, most of the cross-fostering is made 24-72h after farrowing and studies by Bishop *et al.* (2011) and Heim *et al.* (2012) reported no effect on piglet survival when cross-fostering was made 24h after farrowing. This study, made in a private farm (the same used in the Charneca *et al.* (2013) study) aimed to evaluate the effects of the litters uniformity at 24h post-farrowing on piglet survival and growth.

## MATERIALS AND METHODS

### Farm, animals, feeding and general management:

This study was made in a private intensive pig farm (herd size about 1000 sows) located in the south of Portugal, near the city of Évora. Fifty-two Topigs 20 sows and their piglets were used. Sows were placed in the maternity rooms, in individual farrowing crates 5-7 days before the previewed farrowing rate and fed with standard commercial diet (2129Kcal/Kg NE, 15% crude protein, and 0,8% lysine) gradually decreasing from 3.3Kg/day to no feeding on the farrowing day. After farrowing a lactation diet (2300Kcal/Kg NE, 16% CP and 0,9 lysine) was provided starting with 2Kg/day and gradually increasing up to 7Kg/day quantity that was maintained until the weaning day. To the piglets, and from day 7 up to weaning day (d28 on average) a solid pre-starter diet (2355 Kcal/Kg NE, 17% CP and 1.3% lysine) was provided. Farrowing were induced with a PGF2α synthetic analogue on day 113 of gestation and farrowings were supervised. Usually on the day after farrowing the farm workers performed piglet dock tailing and iron intramuscular administration.

### Experimental procedures:

At birth each live born piglet was roughly dried with dry powder, identified with an ear tag and birth hour and sex were register. Afterwards the piglet was weighed (Kern DE 12K1N, weighing limit 12 kg and 1g precision), procedure repeated at 24h and 21d of

live, and placed close to his mother. All farrowing data was register: duration, total born, born alive, stillborn.

Experimental litters were constituted at 24h after birth: Uniform litters (HOM) and Heterogeneous (HET) litters, with 12 piglets each. The within litter variation coefficient on weight should be equal or less than 10% for HOM litters and equal or more that 20% for HET litters. All piglets found dead since birth up to d21 of lactation were register and weighed as soon as detected but they were not necropsied. No cross-fostering was made in the experimental litters until d21.

The colostrum intake (CI) during the first 24h was estimated based on the weights at birth and at 24h and using the equation described by Devillers *et al.* (2004).

**Statistics:**

The data were analyzed with the software SPSS Statistics (version 22, 2013). Descriptive statistic of data was performed. The comparison between experimental litters was made ANOVA using litter type as fixed effect, batch as random effect and the interaction between litter type and batch. Both batch and interaction type x batch were not significant for the analyzed traits and were removed from the model. Pre-weaning mortality rates of litter types were compared using the Chi-squared test. Unless otherwise mentioned, the presented values are means ± standard error of mean (SEM). Differences were considered significant for p-value <0.05.

## RESULTS AND DISCUSSION

### Reproductive and productive data of original litters

The mean parity of sows was 5.3±0.3 (2 to 8). On average the farrowing process (time between the birth of the first and the last piglet of the litter) took 257±15 min a value in accordance with the reported by Decaluwé *et al*. (2014) and Le Dividich *et al*. (2017).

The litter size of total born (TB), born alive (BA) average 16.2±0.4, 15.6±0.3, both values higher than the reported for France in 2015 (IFIP-GTTT, 2018) probably because of the careful reproductive management (corporal condition at weaning, accurate heat detection, correct artificial insemination) in the farm. The stillbirths were 0.4±0.1 a low value

compared to the same report (IFI-GTTT, 2018) that can be related to the level of farrowing assistance in the farm and during the trail, avoiding misclassification of piglets.

The litter total weight was 19.9±0.5 Kg and the individual piglets weight at birth was 1.32±0.02Kg, comparable to the observed several studies with equivalent or similar genetics (Quesnel *et al*., 2008; Charneca *et al*., 2013; Declerck *et al*., 2017). The intra-litter CV of piglet's weights was 21.1±0.8% in line with the reported values by Quesnel *et al*. (2008), Wientjes *et al*. (2013), and Declerck *et al*. (2017).

The mean CI in the first 24h after birth was 292±9.7g with a within-litter CV of 38.1±1.6%. The mean CI is the range of the 250-300g reported in several studies using the same equation (Decaluwé *et al*., 2014; Declerck *et al*., 2015; Le Dividich *et al*., 2017). It was lower than the observed in our previous study (Charneca *et al*., 2013) most likely because of the increased litter size in the present study (15,6 vs 12 piglets per litter). The observed CV of colostrum intake was close to the value reported by Le Dividich *et al.* (2005) of 40% and can be related to the within-litter weights CV because CI is positively related to birth weight (Charneca *et al*., 2015).

The mortality rate in the first 24h hours after farrowings was 6,0%, which represents around 42% of the total mortality until 21d. The importance of the first 24h on total mortality rate was also observed in the studies of Marchant *et al*. (2000) and Casellas *et al*. (2004).

**Characteristics and performance of the experimental litters**

The data on experimental litters (HOM vs HET) were the result of the cross-fostering procedure allowing to have similar parity of sows (5.2±0.4 vs 4.92±0.4, p=0.572), piglet mean weight (1.49±0.03Kg vs 1.47±0.03Kg, p=0.397) and total litter weight (17.93±0.35Kg vs 17.64±0.37Kg, p=0.397) between litter types. Additionally, the mean CI (by Kg of live weight) of piglets of HOM and HET in the first 24h was also similar (228±5g vs 220±5g, p=0.225, respectively). The only difference between experimental litters at 24h was the intra-litter weight CV (7.18±0.44% vs 22.90±0.46, p<0.001) therefore, eventual differences on the piglets and litter performance differences could only be attributed to this factor. The results of litter size at 21d, litter weigh, individual piglets weight and mortality rate are presented in table 1.

At 21d the mean weight of piglets was similar between litter type and to the observed by Charneca *et al.* (2013) with the same genetics. As the litter size at 21d was also not different between litter types, the total litter weight after that nursing period was also similar. The weight variation at 21d tends to be higher in HET litters in accordance to the observations by Charneca *et al*., 2013). In our previous study (Charneca *et al*., 2013) where HOM and HET litters were made at birth we've observed a significant reduction (6,4% vs 11,9%) of mortality in the HOM litters compared to HET litters, however, in the present study no significant differences were observed indicating the cross-fostering at 24h have no significant impact on pre-weaning mortality of piglets, therefore, confirming the observations by Bishop (2011) and Heim *et al*. (2012). As a conclusion we may say that the time when cross-fostering is performed influence its results, and that 24h cross-fostering has low or no impact on survival and growth of the piglets.

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**Table 1.** Characteristics of the experimental uniform (HOM) and heterogeneous (HET) litters at 21d post-farrowing

| | HOM | HET | p-value |
|---|---|---|---|
| Litter size | 11.08±0.24 | 10.81±0.26 | 0.450 |
| Piglet mean weight (Kg) | 6.17±0.15 | 6.13±0.16 | 0.761 |
| Intra-litter CV (%)* | 17.53±1.38 | 21.54±1.38 | 0.099 |
| Litter total weight (Kg) | 68.13±2.23 | 66.10±2.35 | 0.412 |
| Mortality rate (24h-21d, %) | 7.69 | 8.97 | 0.560 |

* Intra-litter coefficient of variation of piglet weight

**Abstract**

This study aimed to evaluate the effects of litter uniformity (on piglet weight) at 24h post-farrowing on piglet survival and growth until 21d of lactation on a commercial genotype of intensive production. Twenty-four hours after farrowing piglets from 52 sows were selected in order to prepare uniform litters (HOM, n=26, CV=7,2±0,4%) and heterogeneous litters (HET, n=26, CV=22,9±0,5%) of 12 piglets each. The mortality rate between 24h and 21d was not different (7,69% HOM *vs* 8,97% HET, P=0,56). At 21d the mean weight of piglets was not different between litter type being 6,17±0,15kg in HOM and 6,13±0,16kg HET, (P=0,761). The results of this study showed that litter uniformity at 24h has no significant effects on piglet survival or growth until 21d of nursing period.

**Keywords:** piglet, uniformity, survival, growth

# EFEITO DA UNIFORMIZAÇÃO DAS NINHADAS EM PESO ÀS 24H PÓS-PARTO NA SOBREVIVÊNCIA E CRESCIMENTO DOS LEITÕES

## Resumo

Este estudo teve como objetivo principal avaliar os efeitos da homogeneização (em peso dos leitões) das ninhadas às 24h pós-parto, sobre a sobrevivência e o crescimento dos leitões até aos 21 dias de amamentação, num genótipo comercial da produção intensiva. Vinte e quatro horas após o parto, selecionaram-se leitões de 52 porcas de forma a criar ninhadas homogéneas (HOM, n=26, CV=7,2±0,4%) ou heterogéneas (HET, n=26, CV=22,9±0,5%), de 12 leitões cada. A taxa de mortalidade dos 24h aos 21d não foi diferente entre os dois grupos (7,69% HOM *vs* 8,97% HET, P=0,56). Aos 21 dias, o peso médio dos leitões foi semelhante 6,17±0,15kg HOM e 6,13±0,16kg HET (P=0,761). Os resultados deste estudo indicam que a homogeneização das ninhadas às 24h após o parto, não teve efeitos significativos na sobrevivência e crescimento dos leitões.

**Palavra chave:** leitão, homogeneidade, sobrevivência, crescimento