

The Influence of Changing Pen Design From a Small to Large Configuration on the Performance of the Grow-to-Finisher Pig

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Summary and Implications

The objective of this study was to determine the effects of small versus large pens throughout the grow-finish period on growth performance of the pig. This experiment consisted of two replications. One wean to finish site within a large Midwestern commercial production system was used for both replications. The site consisted of four rooms. Within each room, one side of the aisle was set-up with the small pen treatment (SP; $n = 96$ pens [34 pigs/pen; $0.69 \text{ m}^2/\text{pig}$]), while the other side was set-up with the large pen treatment (LP; $n = 12$ pens [272 pigs/pen; $0.69 \text{ m}^2/\text{pig}$]). Pens were mixed sexed and when the first market group of pigs reached the targeted market weight in both treatments the trial was terminated. Starting and ending weights and average daily gain on a pen basis was recorded and calculated for a total of 6,528 crossbred pigs. Performance was analyzed using the PROC MIXED procedure of SAS. Small penned pigs had a higher ADG ($P = 0.004$) and overall gain ($P = 0.05$) than large penned pigs. In conclusion, pigs raised in small pens throughout the grow-finish period had a higher average daily gain and overall gain than pigs housed in large pens throughout the grow-finish period.

Introduction

Several large production systems in the U.S. are currently utilizing large pen configurations (≥ 200 pigs / pen) during the grow-finish period. Johnson et al. (2010) compared small pens (32 pigs / pen) not pre-sorted the day before transportation versus large pens (192 pigs / pen) that were pre-sorted the day before loading and reported that utilizing large pens and pre-sorting prior to loading reduced physical signs of stress during loading and unloading, and

reduced transport losses (dead and non-ambulatory pigs) at the plant by 66% compared to pigs from traditional finisher pens. Despite these beneficial effects on the welfare of the pig during loading and transport, anecdotal reports suggest that growth performance traits may be compromised when pigs are housed in large pen configurations. Therefore, the objective of this study was to determine the effects of raising pigs in small versus large pens during the grow-finish period on growth performance of the finisher pig.

Materials and Methods

Experimental design: The protocol for this experiment was approved by the Iowa State University Institutional Animal Care and Use Committee (4-09-6716-S). The experiment was conducted in two replications between April and December, 2009. The experimental design for this trial was a complete randomized design and pen was the experimental unit.

Animals, housing and feeding: One wean-to-finish site within a large Midwestern commercial production system was used for both replications. The site was divided into two naturally tunnel ventilated buildings that each had two rooms. Each room had fully slatted (2.5 cm wide \times 1.3 m long) concrete floors, an 81 cm-wide center aisle, and pens (7.1 m long \times 3.2 m wide) that provided $0.69 \text{ m}^2/\text{pig}$ of pen floor space. Pens were divided by steel gates (91 cm height), and the back gates of each pen had the ability to swing freely or to be locked in a closed position. This feature allowed the investigators to make single pens or to combine multiple pens. Pigs were fed a standard *ad libitum* grow-finish diet that met or exceeded the nutritional requirements of the pigs for each phase/weight (NRC, 1998). Feed was delivered on demand to a dry four hole feeder (91 cm high \times 53 cm wide \times 1.4 m long, with a 15 cm-deep pan; Nol Thorp Equipment, Inc. Stainless Steel N14160 County Rd M, Thorp, WI 54771-7715). Two nipple cup bowl drinkers were located in each pen. The drinkers were 20 cm long and 30 cm high. Pigs were observed daily at 0800 h to ensure pig health and facility maintenance.

Treatments: For both replications, within each room one side of the aisle was set-up with the small pen treatment (SP; $n = 96$ pens [34 pigs/pen]), while the other side was set-up with the large pen treatment (LP; $n = 12$ pens [272 pigs/pen]). Therefore, both treatments were represented in each room. All pigs were kept in smaller pen configurations for 4 wks and then the back gates of eight consecutive small pens were opened to form one large pen. Pens were mixed sexed and when the first market group of pigs reached

targeted market weight in both treatments the trial was terminated.

Performance: A total of 6,528 crossbred pigs were used. Pigs were weighed at the beginning of the trial (~wk 7 post-weaning) and when the first pigs in both treatments had reached the target market weight. Starting and ending weights and average daily gain (ADG) on a pen basis over the grow-finish period were calculated. To weigh the small pens, all pigs were moved out of their home pen using sort boards and paddles, down the center aisle and onto a weigh scale that measured 6 m long x 3 m wide with 91 cm high sides (Central City Scale Model 640, Central city NE). Swing gates in the large pens were used to split large pen pigs into smaller groups to be handled and moved to the weigh scale as previously described for the small pens.

Statistical Analysis: Data were evaluated for normality of distribution, an assumption of ANOVA, before analysis using UNIVARIATE procedure (SAS Institute Inc., Cary, NC). Data met the assumption of normality and was run using the PROC MIXED procedure of SAS. Treatment (large vs. small pen) was used in the class statement. The statistical main plot model included the parameters of interest (ADG and gain) and the fixed effect of treatment with the random effect of block. Pig starting weight on trial was used as a linear covariate but this was not significant ($P = 0.53$) therefore, this was removed from the final model. A value of $P < 0.05$ was considered significant.

Results and Discussion

Pigs raised in small pens throughout the grow-to-finish period had a higher average daily gain ($P = 0.004$) and overall gain ($P = 0.05$) compared to pigs in the large pen configurations (Table 1).

Table 1. Performance measures for pigs when housed in small versus large pens over the grow-finish phase of production.

Measure	Treatment		P-value
	Large	Small	
No. pens	12	96	
Start, kg	28.8 ± 4.6	29.2 ± 4.6	0.53
End, kg	102.7 ± 1.8	106.5 ± 1.8	0.02
ADG, kg / d	0.80 ± 0.009	0.83 ± 0.009	0.004
Overall gain, kg	73.9 ± 3.1	77.3 ± 3.1	0.05

In conclusion, pigs raised in small pens throughout the grow-finish period had a higher ADG and overall gain compared to pigs raised in large pens. Applying this knowledge to the commercial swine industry may yield several advantages for the producer; including decreased feed costs and fewer days for pigs to reach market weight.

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