Determining Optimum Space Allowance for Nursery Pigs

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Studies were conducted in 2 phases to determine the effects of six different space allowances (k= 0.0230, 0.0265, 0.0300, 0.0335, 0.0370, and 0.0390) on nursery pig behavior, growth and welfare from 3 to 8 weeks of age. Phase 1 was a controlled trial conducted at Prairie Swine Centre (PSC) which explored the effects of housing piglets at the six space allowances in both large (40 pigs per pen) and small (10 pigs per pen) group sizes. Phase 2 used the same space allowances as tested in Phase 1, but studied pigs managed under commercial conditions in two production barns, one in Saskatchewan and one in Manitoba. In Phase 2, pen size remained constant throughout the trial so the targeted k value for each treatment was achieved at nursery exit.

Results from this study suggest that the minimum space requirement for nursery pigs indicated by the Canadian Code of practice for the Care and Handling of Pigs of k= 0.0335 provides a good balance between production costs and pig welfare. Housing nursery pigs at k= 0.0265 (20% below the recommended Code allowance) resulted in reductions in average daily weight gain on commercial farms, and postural changes indicating crowding (increased sitting and reduced lateral lying) in all studies.

INTRODUCTION

Floor space allowance is a complex issue in swine production, and one that is critical for both economic and welfare reasons. There is currently a significant body of research on the effects of space allowances in grow-finish pigs. The most widely accepted method to define floor space allowance (A) is to relate it to the size of pig by converting body weight (BW) with the expression of A = k * BW 0.667. The critical k value of 0.0335 established by Gonyou et al. (2006) is used to define the current minimum space allowance required for nursery pigs by the Canadian Code of Practice for the Care and Handling of pigs (NFACC, 2014). However, very little is actually known concerning effects of space allowance on nursery pigs and there is concern that the k value which is appropriate for finishing pigs may overestimate the requirements of nursery pigs. In determining the optimal space allowance in nursery, the economics of production should be considered along with the effects on piglet growth and welfare. This study set out to address concerns surrounding space allowance in nursery pigs and identify the critical cut-off at which crowding occurs.

MATERIALS & METHODS

Phase 1 Trials

Phase 1 studies took place at the Prairie Swine Centre. Pigs were housed in fully slatted pens, and fed ad-libitum via feed hoppers. The availability of feeder space and drinkers (on a per pig basis) was kept constant across all treatments. A total of 1,200 newly weaned pigs (weaning age: 4 weeks) were studied in six density treatments, tested at two group sizes (10 and 40 pigs per group), in four replicates with one replicate per season to control for seasonal variation. Space allowance was allotted to nusery pigs using the allometric equation, Area = k * BW $^{0.667}$ (where Area= space/pig in m2, k = the constant under test and BW = body weight in kg). The k values tested were: 0.0230, 0.0265, 0.0300, 0.0335, 0.0370 and 0.0390 with space allowance adjusted weekly based on pig weight. These span the range of k values commonly used in commercial barns, above and below the suggested optimum k value of 0.0335 determined by Gonyou et al. (2006). Weekly average daily gain, pen group feed intake, feeding behaviour, body postures and any incidences of morbidity and mortality were recorded per pen.

Phase 2 Trials

Phase 2 studies were conducted in two commercial barns, one in Manitoba and one in Saskatchewan. The farms had different genetics but similar group sizes (approx. 30 pigs at the lowest space allowance). Pigs were fed and cared for in accordance with standard management practices on each farm.

The same six space allowance treatments described in Phase 1 were tested using four replicates per farm in two seasons (summer and winter). Unlike Phase 1, in which pen size was adjusted to maintain a specific density relative to pig size, pens remained constant in size, and the number of pigs per pen was varied to achieve the required density based on the expected exit weight (25 kg).

"The minimum space requirement for nursery pigs provided in the 'Code' provides a balance between production cost and pig welfare."

Data Collection

Information on pig diets, management protocols, pen and barn environment were collected for each facility. Both individual pig and group weights were collected at entry and exit, and group weights were collected at mid-point in the nursery growth cycle to determine average daily gain. At weighing, skin lesions, general health, pen cleanliness, ear necrosis and tail biting scores were assessed for each pen by a trained observer. In both phases pig behaviour was studied one day week in weeks 1, 3 and 5. For Phase 1 pig behaviour was recorded for 8 hours using video cameras suspended directly above each pen. Scan sampling was

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performed at 30-minute intervals to record postures (sternal or fully recumbent), and the number of pigs overlying. Feeding and drinking behaviours were monitored continuously for 8 hours on one day in weeks 1, 3 and 5.

Table 1. Effect of six different space allowances on productivity measures in commercial farms. Average daily gain (ADG), Average daily feed intake (ADFI) and Feed efficiency (Gain:Feed- G: F).

	k =0.023	k =0.0265	k =0.03	k =0.0335	k =0.037	k =0.039	SEM	P
ADG*	0.38	0.39	0.40	0.40	0.41	0.42	0.01	0.001
ADFI	0.80	0.83	0.84	0.86	0.86	0.86	0.02	0.06
G:F	0.69	0.67	0.69	0.69	0.70	0.71	0.01	0.9

*Overall significant effect of space allowance on the production variable.
SEM= standard error of mean, P= p-value

RESULTS AND DISCUSSION

Productivity

Average Daily Gain (ADG) was greatly influenced by the barn where the study was conducted. In the phase 1 trial at the research barn (Prairie Swine Centre), ADG was not significantly affected by the different space allowance treatments. However, for Phase 2 ADG was significantly increased with higher space allowance with differences depending upon the farm (Table 1, Figure 1) and season. ADG was significantly higher in winter than summer in the phase 2 commericial barn trial.

Effect of space allowance on behaviour

Space allowance and group size had similar effects on feeding and drinking behaviour of nursery pigs. As space allowance was reduced or group size was increased (from 10 to 40 pigs), the percentage of time spent feeding or drinking decreased. However, the number of feeding bouts increased to compensate. Sitting behaviour increased significantly at lower space allowances. Sitting postures require less floor space than standing or lying, so this is interpreted as an indication of crowding. Sitting has also been associated with poor welfare in pigs. Space allowance did not have a significant effect on skin lesions on the body, ears or tail of nursery pigs in either phase 1 or phase 2.

Group size and age of the nursery pig had a strong effect on lying behaviour (sternal, recumbent and overlying). Space allowance had minimal effect on the lying behaviour. Sternal recumbency and overlying behaviour reduced with age,

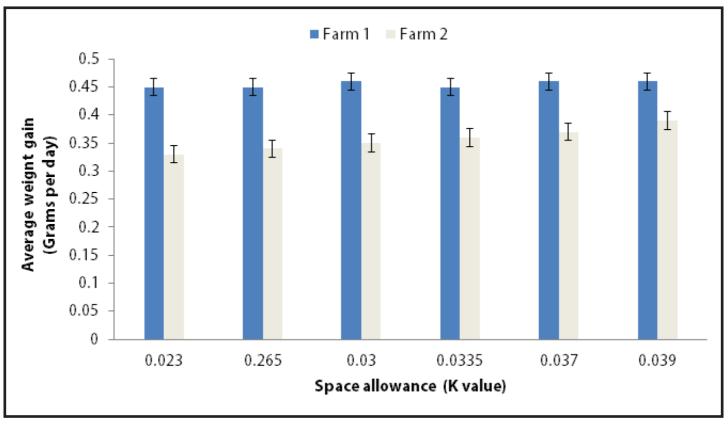

Figure 1. Average weight gain (0 to 43 days). Different space allowance (k-value) on Phase 2 commercial trials.

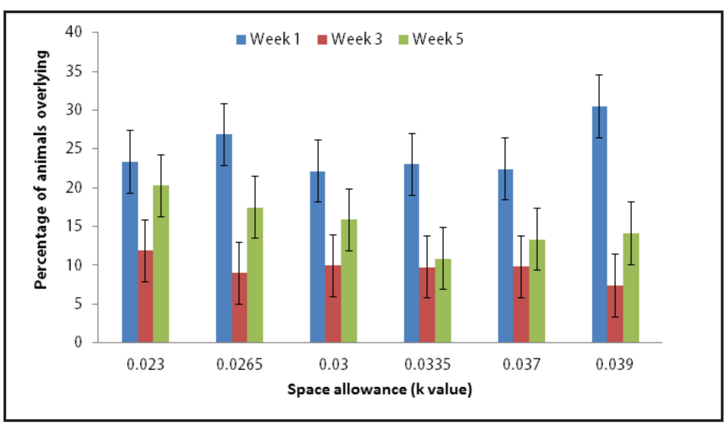

Figure 2. Predicted percentage of animals overlying in response to different space allowances in nursery weeks 1, 3 and 5.

while lateral lying increased. Overlying behaviour reduced by 50 percent after the first week (Figure 2), therefore reducing space allowance based on the assumption that pigs will overlie is not justified and can negatively impact the productivity and welfare of nursery pigs.

As the temperature in the barn increased, the percentage of pigs standing decreased with a corresponding increase in the percentage of pigs in lateral recumbency. At higher ambient temperatures pigs lie on their sides more in order to increase body contact with the floor and maximize heat loss.

CONCLUSION

Results indicate that providing nursery space allowances at and above k= 0.0335 had a positive effect on the productivity and resting behaviour of nursery pigs. Although ADG reached a ceiling effect at k=0.335 in commercial studies, there was no indication that lateral lying reached a ceiling effect at this space allowance. Space allowances above k= 0.0335 may result in further changes to piglet posture and an increase in comfort behavior (e.g. increased lateral lying near the end of the Nursery phase). Higher space allowances increased resting behaviour (lateral recumbency) and reduced overlying behaviour.

Postural behaviours were significantly affected by age of the nursery pigs. Therefore overlying behaviour cannot be used as a justification to reduce space allowances as pigs are most crowded at the end of nursery phase (due to growth) and this is time that lateral lying is preferred.

No effects of group size on pig growth or behaviours related to welfare were found. Therefore, there was no evidence that larger groups require less space than small groups, however, the maximum group size studied was 40 pigs, which is smaller than is found on many commercial farms.

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