**Application**

Similar growth performance is achieved at both low and high floor space allowances in pens with optimal hygiene; however, increasing floor space allowance will improve growth and feed efficiency in pens with sub-standard hygiene. Providing an additional feeder space will improve feed efficiency of pigs when both low and high floor space allowance is provided.

**Introduction**

Management factors that can influence post-weaning (PW) pig growth include pen hygiene (Halpin *et al.*, 2024) and floor space and feeder space allowance (Wolter *et al.*, 2003). However, it is likely that the growth responses to some of these factors will be affected by the others. The hypothesis was that increasing pen hygiene (sub-standard to optimal), floor space allowance (0.35m2/pig to 0.70m2/pig) and feeder space allowance (single to double) will each increase post-weaning pig growth to day (D)45 PW and that there will be interactions in effect between each. This hypothesis will be tested in a 2x2x2 factorial arrangement.

**Materials and methods**

The experiment was a 2x2x2 factorial arrangement with factors being weaner pen hygiene (sub-standard vs optimal), floor space allowance (0.35m2/pig or 0.70m2/pig) and feeder space allowance (single or double). The optimal hygiene protocol was applied to vacated weaner pens as follows: 1. 1% carboxylic acid-based detergent (Blast Off) application allowing a contact time of ~40 minutes, 2. Washing with cold water, 3. Drying for 48h, 4. Chlorocresol-based disinfectant (Interkokask) applied at a rate of 3%, 5. Further drying for 12 days before introduction of weaned pigs. The sub-standard hygiene protocol was applied to vacated weaner pens as follows: 1. Washing with cold water, 2. Overnight drying (<18h) before entry of pigs. Prior to entry of pigs, pens from both hygiene treatments (N=24 sub-standard and N=20 optimal) were swabbed at three locations (piglet lying area, dunging area and feeder) using adenosine triphosphate (ATP) bioluminescence swabs. Single and double feeder space allowance was achieved by providing a single-spaced (width = 225mm) or a double-spaced (width = 400mm) wet-dry feeder per pen, respectively. A floor space allowance of 0.35m2/pig or 0.70m2/pig was achieved by stocking pens (2500 x 2000mm) with 14 and 7 pigs/pen, respectively. At weaning (28 ±1.2 days of age), pigs were formed into same-sex (entire male or female) pen groups of even weight. Pen groups were blocked on sex and weaning weight (8.7±1.5 kg) and randomly assigned to treatment (N=12 pen replicates per treatment). Pigs were fed a common sequence of diets until transfer at D45 PW (32.8±5.0kg). Pig weight and feed disappearance were determined at D6, 13, 20, 27 and 45 PW to calculate average daily gain (ADG), average daily feed intake (ADFI) and feed conversion ratio (FCR). Data were analysed using repeated measures analysis in PROC MIXED (v9.4, SAS Institute Inc.). The model included pen hygiene, floor space allowance, feeder space allowance and their associated interactions as fixed effects with block included as a random effect and weaning weight included as a co-variate when significant.

**Results**

At entry of pigs to the weaner accommodation, ATP concentrations (log10 [Relative Light Units]/cm2) were 1.85 and 0.44, ±0.11 for the piglet lying area (P<0.001); 1.93 and 1.21, ±0.10 for the dunging area (P<0.001); and 1.04 and 0.63, ±0.09 for the feeders (P<0.001), for the sub-standard and optimal hygiene protocols, respectively. There was no pen hygiene x floor space allowance x feeder space allowance interaction (P>0.05) for any parameter of interest; therefore, only 2-way interactions were considered. There was a pen hygiene x floor space allowance interaction for body weight (BW), ADFI and ADG. Increasing floor space (0.70m2/pig) with sub-standard hygiene increased BW at D45PW (P<0.001); ADFI from D27-45PW (P<0.05); ADG from D20-27 (P<0.05) and D27-45PW (P<0.05); and reduced FCR from D20-27PW (P<0.05) but not with optimal hygiene (P>0.05). There was a pen hygiene x feeder space interaction for FCR from D27-45PW. Increasing feeder space allowance under both sub-standard and optimal hygiene conditions reduced FCR (P<0.001) with increased feeder space giving better FCR with optimal than with sub-standard hygiene (P<0.05). There was an overall floor space allowance x feeder space allowance interaction for BW and ADG (Table 1). Increasing floor space allowance in pens with single-spaced feeders increased BW (P<0.001) and ADG (P=0.02) but this was not the case when pigs were fed from double-spaced feeders (P<0.05). Providing additional feeder space at both low or high floor space allowances reduced FCR from D27-45PW (P<0.02; Table 1).

**Table 1: Effect of floor space and feeder space allowance on post-weaning pig growth performance.**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Floor Space Allowance | 0.35m²/pig | | 0.70m²/pig | | SEM | P-value | | | |
| Feeder space allowance | Single | Double | Single | Double | Floor | Feeders | | Floor x Feeders |
| No: Pens | 24 | 24 | 24 | 24 |  |  | |  |  |
| **BW1 (kg)** |  |  |  |  |  |  | |  |  |
| Overall (D0-45PW)5 | 16.9b | 17.4ab | 17.8a | 17.5ab | 0.21 | 0.001 | | 0.47 | 0.02 |
| **ADFI2 (g/d)** |  |  |  |  |  |  | |  |  |
| Day 27-45PW | 1156b | 1149b | 1258a | 1192ab | 23.5 | 0.001 | | 0.10 | 0.002 |
| **ADG3 (g/d)** |  |  |  |  |  |  | |  |  |
| Overall (D0-45PW) | 475b | 504a | 527a | 521a | 9.8 | <0.001 | | 0.11 | 0.02 |
| **FCR4 g/g** |  |  |  |  |  |  | |  |  |
| Day 20-27 PW | 1.41a | 1.30b | 1.28b | 1.22b | 0.044 | 0.01 | | 0.05 | 0.02 |
| Day 27-45 PW | 1.50a | 1.42b | 1.50a | 1.40b | 0.034 | 0.50 | | 0.001 | 0.002 |
|  |  |  |  |  |  |  | |  |  |

1BW= Body Weight 2ADFI= Average Daily Feed Intake 3ADG= Average Daily Gain 4FCR= Feed Conversion Ratio 5= PW= Post-weaning

**Conclusion**

Providing a double-spaced feeder reduced FCR from D27-45 PW in both sub-standard and optimal hygiene environments, with the greatest effect observed with optimal hygiene. Increasing floor space allowance improved growth and feed efficiency from D27-45 PW in pens of sub-standard hygiene but not in pens of optimal hygiene. Therefore, it is possible to achieve the same growth and feed efficiency at a floor space of 0.35m2/pig or 0.70m2/pig when pen hygiene is optimal. Providing an additional feeder space will reduce feed efficiency of pigs when both low and high floor space allowance is provided.

**Acknowledgements**

Irish Department of Agriculture, Food and the Marine’s Competitive Research Funding Programme (Grant no: 2019R518).

**References**

Halpin, K.M., Lawlor, P.G., Arnaud, E.A., Teixé-Roig, J., O’ Doherty, J.V., Sweeney, T., O’ Brien, T.M., and Gardiner, G.E. (2024). *Translational Animal Science,* 8, txae095. doi: 10.1093/tas/txae095.

Wolter, B.F., Ellis, M., Corrigan, B.P., DeDecker, J.M., Curtis, S.E., Parr, E.N., and Webel, D.M. (2003), *Journal of Animal Science.* 81(4), 836-842. doi: 10.2527/2003.814836x.