Determining the Optimum Stocking Density in Nursery Pigs

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SUMMARY

Floor space allowance is a complex issue in swine production, and one that is critical for both economic and welfare reasons. The quantity of space provided substantially affects pig welfare by influencing behaviour, stress and social interactions, and has significant economic impacts on productivity and the total pig throughput possible on a farm. It's important that recommendations for the minimum floor space allowance for groups of pigs are not arbitrary, but based on sound biological and economic research. The current space allowance requirements specified in the Canadian Code of Practice for the Care and Handling of Pigs are largely based on research performed on grower-finisher pigs. However, comparatively little is known on the effects of space allowance on nursery pigs, and current space allowance requirements may overestimate the requirements for nursery pigs due to their increased willingness to overlie one another. The objective of this project is to determine a precise value for the minimum space allowance for nursery pigs which provides an optimal and scientifically defensible balance between profitability and animal welfare.

INTRODUCTION

Floor space allowance is a complex issue and one that is critical for both economic and welfare reasons. The most widely accepted method in defining floor space allowance (A) is to relate it to the size of pig by converting body weight (BW) through the expression of $A = k * BW^{0.667}$. The critical k value established by Gonyou et al. (2006) was used to calculate the minimum required space allowance for nursery pigs in the Canadian Code of Practice for the Care and Handling of Pigs (NFACC, 2014). However, relative little is known concerning effects of stocking density allowance on nursery pigs (EFSA, 2005; Gonyou et al., 2006), and tit is hypothesized that the k value which is designed for finishing pigs may overestimate the requirements of nursery pigs, as nursery pigs have a greater willingness to overlie one another.

Although individual pig growth declines at higher densities, it has been reported farm profitability can increase as we increase pig density, as fixed costs are spread across a greater number pigs (Kornegay and Knotter, 1984). Therefore the economic optimum for space may be lower than that for achieving maximum growth rate. However, stocking at higher densities can also negatively affect the welfare of the pig, with risk of immune suppression and increased disease susceptibility (Turner et al., 2000) and restriction of pigs' ability to express normal behaviors.

It has been recommended that evaluations of space requirements for pigs should include changes in the behaviour of pigs, and establish the welfare relevance of such changes, to support calculation of space allowances based on what space an animal needs rather than solely on the basis of production performance (Ekkel et al., 2003). Group size and seasonal differences should also be evaluated or controlled for as these factors may also influence growth and behavior (Hyunh et al., 2005, Spoolder et al., 2012),. It has been suggested that larger groups of pigs may require less space, due to the sharing of free space (McGlone and Newby, 1994). However, this has also been disputed (Street and Gonyou, 2008).

This study will examine measures of productivity and welfare in nursery pigs, and will include an economic analysis comparing space allowance treatments above and below the Code requirement of k= 0.0335.

"Preliminary results suggest that housing pigs at a lower space allowance did not negatively affect the growth of animals."

MATERIALS AND METHODS

Phase 1

Animals: Density studies at PSCI were conducted using 1,200 newly-weaned pigs that were housed in the nursery for 5 weeks. Piglets were housed at one of six different densities (k= 0.023, 0.0265, 0.0300, 0.0335, 0.0370, and 0.0390) in pens of either 10 or 40 pigs/group. Four four replicate trials were completed over a one year period, with one replicate per season. Pigs were weighed weekly and pen size was adjusted weekly to the prescribed density based on the predicted average body weight. Two temperature and humidity monitors (iButtons) were placed in each pen, suspended approximately 15cm above pig height to monitor conditions at pig level. An additional iButton was suspended in the center of the room to monitor room temperature and humidity throughout the trial.

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Data collection: Video cameras were placed above each pen to record pig behaviour for a 24 hour period once per week. An infra-red setting was used during the hours of darkness. Scan sampling at 15 minute intervals was used to identify laying postures and overlying behavior. Standard nursery diets were provided ad libitum, and feed weigh backs were recorded weekly. Total feed consumption and animal weights were recorded on a weekly basis.

Lesion scores were assessed weekly as pigs were weighed, and used as an estimate of aggression (Table 1). Saliva samples were collected weekly from four focal pigs for determination of cortisol as an indicator of stress. The immune response was tested in six pigs per pen, with pigs receiving vaccines for Mycoplasma hyopneumonie. Serum samples were collected at three time points to determine M.hyo specific IgG as a measure of immune competence.

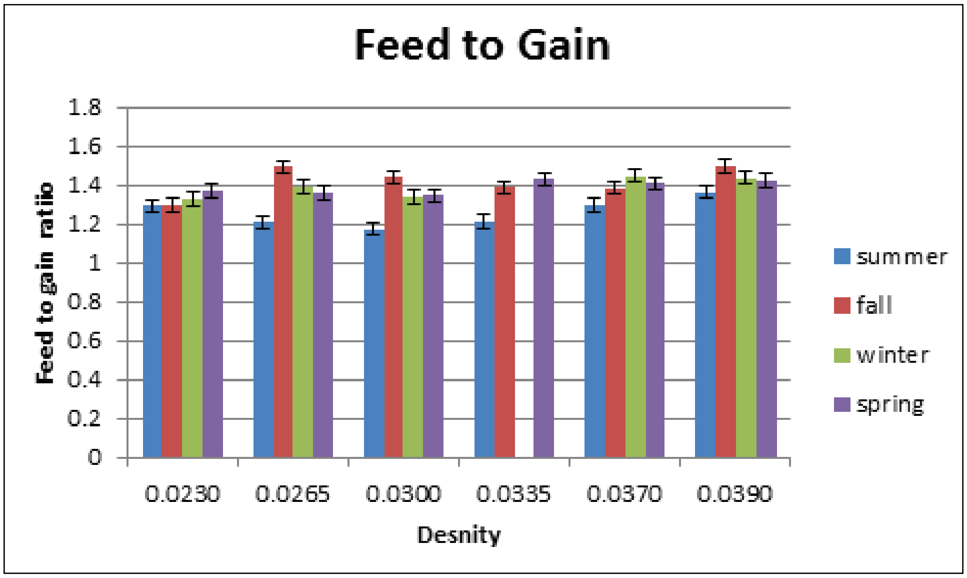

Figure 1. Feed to gain ratio in Phase one trials

RESULTS AND DISCUSSIONS

Growth

Pigs on trial gained an average of 0.3924 Kg per day, with the best growth occurring during the summer months at densities 0.0265 and 0.0390. There were no noticeable differences in ADG between densities; pigs given less space at a k value of 0.0230 did just as well on average as pigs given the most space (k = 0.0390), however there were some seasonal interactions with density. As shown in Figure 4 the feed to gain ratios observed were fairly consistent across seasons and densities, with the summer months being the best for all densities.

Immune Response

A seasonal effect on immune titers was seen with the highest titer values in summer. As only a minor immune challenge (inactivated m. hyopneumoniae vaccine) was present, it is plausible that increased titer and growth rates result from improved ventilation in summer months. Low titer levels and poor growth response during the cooler months may indicate that animals are facing other immune challenges at this time. There were no apparent effects of density treatment, indicating that the tighter densities did not affect immunity.

CONCLUSIONS

Based on Phase 1 of the study conducted at Prairie Swine Centre, preliminary results suggest that housing pigs at a lower space allowance did not negatively affect the growth of animals. However, final conclusions are not available as analysis of piglet behavior and stress response has not been completed, and the commercial trials are ongoing.

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