

**Title:** Effect of stocking density on the welfare and performance of grow-finish pigs - **NPB #04-093**

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### Abstract

Welfare and performance of grow-finisher pigs were evaluated in groups of 19 barrows, in 2 levels of group weight composition, uniform (pigs of body weight above 25 and below 75 percentiles) or varying body weights (pigs of body weight below 25 and above 75 percentiles) and at 4 levels of floor space allowances calculated allometrically for a final slaughter weight of 116 kg by using 'k' values of 0.027, 0.031, 0.034, and 0.037. The four space allowances were 0.64 m<sup>2</sup>/pig (SA0.64), 0.74m<sup>2</sup>/pig (SA0.74), 0.81m<sup>2</sup>/pig (SA0.81), and 0.88 m<sup>2</sup>/pig (SA0.88). The trial was conducted in Eastern Minnesota on a commercial farm with fully slatted floor following a 4 x 2 factorial design across 32 pens. Behavior data using video camera and time-lapse VCR, total injury scores (TIS) and saliva samples were collected from 5 randomly identified focal pigs from each pen. Behavior observation, injury scoring and saliva collection were started when pigs reached body weight of 75 kg in any one of the pens. Saliva collection and injury scoring were conducted at weekly intervals and behavior observation at two week intervals. Video tapes were analyzed for agonistic and non-agonistic social interactions and postural behaviors, using the software "Observer". Saliva samples were analyzed for cortisol concentration using radioimmunoassay. Pigs were individually weighed at the start and again at bi-weekly intervals up to 6 weeks and weekly thereafter up to 14<sup>th</sup> week of the trial. Actual 'k' value for each pen, average daily gain (kg/day - ADG) and pen efficiency were determined. Incidence of diseases and mortality observed during the study period were recorded. The data were analyzed using descriptive statistics, repeated measures of ANOVA, one way ANOVA and multivariate linear regression.

The pigs in SA0.64 had lower ( $P<0.05$ ) ADG than those in SA0.88 and SA0.81 whereas pigs in SA0.64 and SA0.74 did not differ ( $P>0.05$ ) in ADG. Pigs in SA0.88 reached a k of 0.037 at 13-14 weeks after the start of the trial, at an ADG of 1.08. Pigs in SA0.64, SA0.74 and SA0.81 reached the same k at 7-8, 10, and 12 weeks respectively after the start of the trial, with corresponding ADGs of 0.83, 1.0 and 0.94. ADG had a positive association ( $P<0.05$ ) with body weight and a negative association with calculated  $k \leq 0.030$ . Weight categories did not differ ( $P>0.05$ ) in final body weight at 14<sup>th</sup> week. Pigs in SA0.64 had higher ( $P<0.05$ ) overall pen efficiency (1.344 Kg daily gain/ m<sup>2</sup> space) than those in SA0.74, SA0.81 and SA0.88 (1.224, 1.131 and 1.063 Kg daily gain/ m<sup>2</sup> space respectively). Pen efficiencies were not different ( $P>0.05$ ) among the space allowance treatments during the final three weeks.

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Pigs in SA0.64 had higher ( $P<0.05$ ) TIS than those in SA0.88 and SA0.81. Total injury scores were different ( $P<0.05$ ) across different time points. Cortisol concentrations (ng/ml) did not differ ( $P>0.05$ ) with space allowance treatments. Salivary cortisol concentration was higher ( $P<0.05$ ) at initial stages of grow-finish period. Average number of aggressive interactions were higher ( $P<0.05$ ) in SA0.64 compared to that in SA0.88 and SA0.81.

Pigs in SA0.64 spent a lower ( $P<0.05$ ) proportion of time lying in preferred areas (body supported on side walls of the pen rather than at the central area or near the feeder) than pigs in SA0.88 and SA0.81. Pigs in the varying weight group spent higher proportion of time lying in preferred area ( $P<0.05$ ) than pigs in the uniform weight group. Pigs spent less ( $P<0.05$ ) proportion of time in preferred lying area at later stages of grow-finish period. The proportions of time spent on lateral recumbency and on lying in isolation were less ( $P<0.05$  for both) at later stages of grow-finish period. Pigs in SA0.74 and SA0.64 spent lower proportion of time ( $P<0.05$ ) lying isolated than pigs in SA0.81. Proportion of time spent lying (irrespective of location and posture) was less ( $P<0.05$ ) and that on sitting, standing and exploratory behavior were higher ( $P<0.05$  for all) in the final stages of grow-finish period. Uniform weight group showed more ( $P<0.05$ ) exploratory behavior than varying weight group. Mortality rate observed was 3.45 %.

The results indicated welfare benefits in terms of postural behavior, lower injury scores and aggression in higher space allowance treatments. The performance and welfare of pigs in  $0.81\text{m}^2/\text{pig}$  and  $0.88\text{m}^2/\text{pig}$  were comparable at market weight of 116kg. Allotting grow-finishers according to uniformity or variation in body weight may not provide any differential benefit in ADG or overall welfare. Although, a beneficial effect was observed in terms of ADG, injury scores, aggression and lying behavior by increasing space allowance, an increase in space allowance from 0.64 to  $0.74\text{m}^2/\text{pig}$  did not result in significant benefit. Similarly reducing space allowance from 0.81 to  $0.74\text{m}^2/\text{pig}$  also did not cause further disadvantages in terms of ADG, lying behavior, injuries and aggression. It may be concluded that in fully slatted floor, space allotted considering the final market weight of barrows, corresponding to 'k' values of 0.037 and 0.034 appear to be acceptable when compared to a 'k' value of 0.27 in production and welfare terms. A 'k' value of 0.031 was intermediate to higher (0.037 and 0.34) and lower (0.027) 'k' values.