**PE1.28 Deep-litter housing conditions during early growth can have a detrimental effect on pork quality 212.00**

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**Abstract- A production strategy used to manage the inefficiencies associated with commercial pig production in deep-litter housing was assessed to determine the impact on pork quality. At 3 weeks of age 160 female pigs were allocated to groups of 10 and housed within conventional or deep-litter production systems. At 13 weeks of age groups were moved to either the alternate housing system or to a new pen within the existing housing system. Pigs were slaughtered at 24 weeks of age and objective pork quality was assessed. Results indicated that pork from pigs started in conventional housing was more tender and paler in colour than pork from pigs started in deep-litter housing. It was concluded that in finished pigs, housing conditions during early growth can significantly affect pork quality.**

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**Index Terms— pig housing, pork quality.**

## I. INTRODUCTION

In Australia the two types of pig production systems commonly used to raise slaughter pigs are 1) conventional intensive systems, where pigs are housed in small groups on slatted floors in an insulated and often environmentally controlled building, or 2) deep-litter shelters where pigs are housed in large groups on fibrous bedding material such as straw. Deep-litter systems are naturally lit and naturally ventilated. Anecdotal observation suggests that pigs housed in deep-litter production systems have reduced growth performance and are fatter than pigs housed in conventional production systems, particularly during the finishing period. A strategy employed by some producers to manage these supposed inefficiencies in deep-litter-housed pigs are to wean pigs into deep-litter systems and then finish them in conventional housing facilities. The smaller group sizes, characteristic of conventional housing, allow easier management of variation in weight and P2 backfat depth because there is greater flexibility in the grouping and sorting of pigs and the ability to feed according to growth requirement. The consequence of moving pigs into a new pen can result in a significant reduction in daily gain [1,2], and the duration of the effect on pig growth varies depending upon the degree of change. Moving pigs between deep-litter and conventional housing systems during growth negatively affects growth, with the impact being greatest for pigs moved from conventional to deep-litter housing [3]. The reduction in growth is initiated by a stress response in the pig to the altered social structure within pen groups and the differences in the physical and thermal environments between housing systems. Pork quality can differ between pigs raised in different production systems, however results are variable [3]. The use of dietary treatments to manipulate the growth path and induce compensatory growth during the finishing growth period have also been found to alter pork quality [4]. This experiment was designed to quantify the impact of moving pigs during the grower period to an unfamiliar housing environment for finishing on pork quality.

## II. MATERIALS AND METHODS

Animals and Treatments Conventional housing (C) consisted of commercial weaner and grower-

finisher pens (partially slatted) within an insulated building. The deep-litter housing (D) consisted of two shelters, both divided into four pens and bedded with cereal straw. One hundred and sixty female pigs were stratified by live weight (LW) at weaning (3 weeks of age; 5.5 ± 0.08 kg LW) and randomly allocated to four treatments. Treatments consisted of 2 housing treatments, C or D, across 2 growth periods: i) early (3 to 13 weeks of age) and ii) late (13 to 24 weeks of age) (Table 1). There were 4 pens per treatment and 10 pigs per pen. Pigs were phase-fed commercial pelleted diets following a feed budget over the following LW ranges: Creep (5.5-7 kg), Weaner (7-16 kg), Grower 1 (16-35 kg); Grower 2 (35-47 kg), Finisher 1 (47-68 kg), Finisher 2 (68-82 kg) and Presale (82-120 kg). At approximately 24 weeks of age pigs were slaughtered at a commercial abattoir. Pork Quality Twenty four hours post-slaughter approximately 1 kg of longissimus dorsi (l.dorsi) plus subcutaneous fat and skin was removed from the left side of the carcass, in a posterior direction from the point of the last rib, to assess objective pork quality. A 20mm steak was cut from the sample and pHu, colour and drip loss were measured on the freshly cut surface that had been allowed to bloom for 10 minutes. Drip loss was measured using the filter paper method [5] and surface lightness (L*), redness (a*) and yellowness (b*) were measured using a Minolta Chromameter CR-400. A 100g block of l. dorsi was used to determine cook loss and measure shear force (Warner Bratzler shear blade fitted to an Instron Universal Testing Machine). Statistical analyses Data were analysed using Genstat 11th Edition 2008 (Lawes Agricultural Trust) to conduct two-way analyses of variance.

## III. RESULTS AND DISCUSSION

Housing during the early growth period, from weaning to 13 weeks of age, affected technological pork quality of pigs slaughtered at 24 weeks of age. Thus, pork from pigs that were housed in the conventional system during the early growth period (CC and CD) had lower shear force values (P=0.003) than pigs weaned into the deep-litter housing system indicating pork from DD and DC housed pigs was less tender. Pork from pigs weaned into the conventional housing system had lower pHu (P=0.008), higher relative lightness (L*) values (P=0.03) and higher relative yellowness (b*) values (P=0.05) compared to pigs weaned into deep-litter housing, indicating that pork from CC and CD pigs was paler than pork from DD and DC pigs. There was no effect of treatment on percent drip loss or percent cook loss. Also, there was no effect of housing during the late growth period and there was no interaction between housing and growth period (P>0.13) (Table 2). The pHu of pork affects a number of quality factors including water holding capacity (WHC) [6], where at low pH the muscle protein structure is disrupted, WHC is reduced and therefore drip loss increases. High levels of drip loss can contribute to a reduction in tenderness [7] however results from the current study are not in agreement as pH¬u was the highest in pork from DD pigs, which also had the highest shear force values indicating this pork was the least tender. Altered growth paths can affect pork tenderness. Pork from pigs experiencing elevated rates of gain as a consequence of compensatory growth, can be more tender than pork from pigs that have had a consistent growth rate. During compensatory growth there can be a higher rate of protein turnover within the muscle [8]. Pigs in deep-litter systems are more active than pigs raised in conventional housing [9]. Increased physical activity can affect pork tenderness and pHu by altering muscle physiology via reduced levels of intramuscular fat [10], increased levels of muscle collagen [11] and by changing the ratio of the different muscle fibre types [7]. Pork colour is affected by pHu. At low pHu the disrupted structure of the muscle protein is more ‘open’ scattering light and giving a pale appearance, as for the pork from the pigs started in the conventional housing system. Low pHu also increases the oxidation of the myoglobin to metmyoglobin, which has low colour intensity [12] and therefore meat appears paler.

## IV. CONCLUSION

Results from the current experiment suggest that housing conditions during early growth can affect pork quality in finished pigs. Pork quality differed between pigs that were conventionally-housed and deep-litter-housed from weaning to 13 weeks of age. Measures of objective pork quality indicated that pork from pigs housed in the deep-litter system during early growth was less tender and darker in colour than pork from pigs that were weaned into the conventional housing system.

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