Agri-Food and Biosciences Institute

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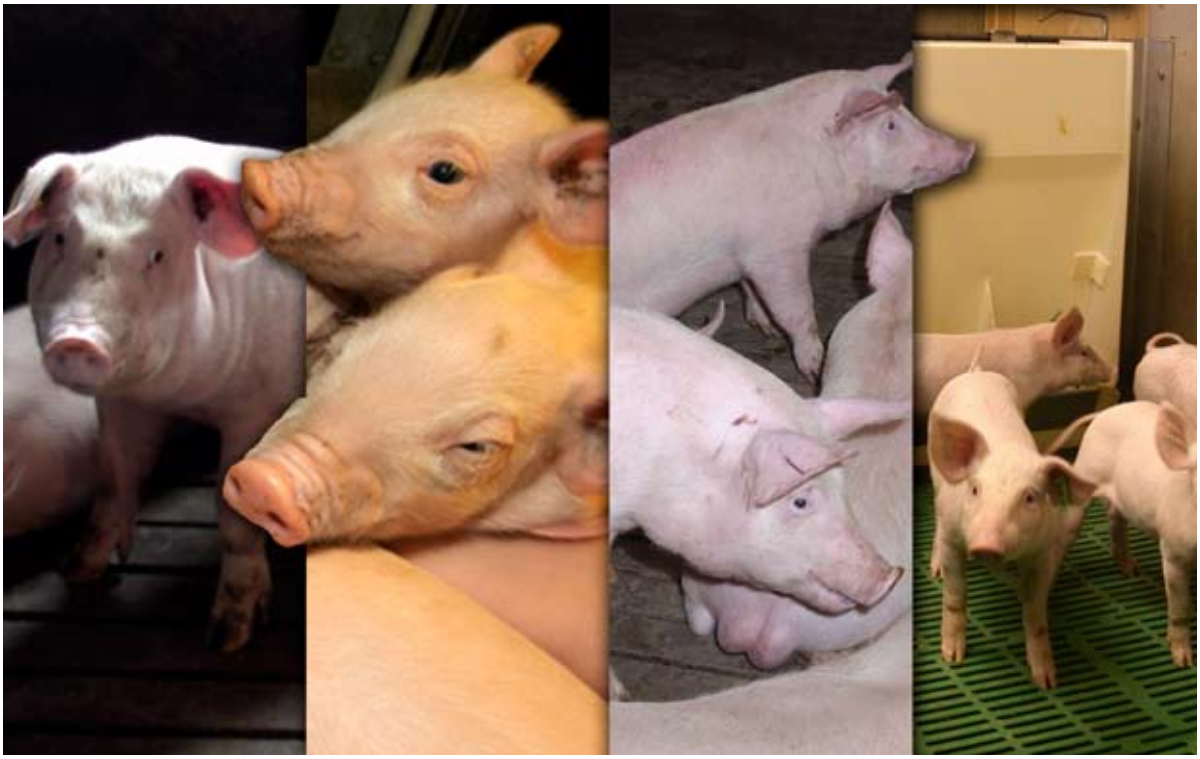
Strategies for reducing within-group variation in slaughter weight of pigs



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Niamh E O'Connell, Violet E Beattie and Dennis Watt

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1. EXECUTIVE SUMMARY

The aim of the present study was to assess whether within-group variability in slaughter weight and carcass weight could be reduced by the regrouping strategy used at either weaning at 4 weeks of age, or at the start of the finishing period at 10 weeks of age. Groups were formed to be either uniform in body weight (i.e. separate groups of small, medium and large pigs), or mixed in body weight (i.e. each group containing small, medium and large pigs). Pigs either remained in the same group from 4 to 21 weeks of age, or were regrouped at 10 weeks of age.

Forming uniform weight groups at 4 weeks of age had no effect on within-group range in slaughter or carcass weight. It is suggested that this was due to high variability in growth during the growing period. Forming uniform weight groups at 10 weeks of age led to significant reductions in within-group range in slaughter weight. This meant that the time taken for all pigs in a group to reach slaughter weight was reduced by 1 week when uniform weight groups were formed at 10 weeks of age, compared to when mixed weight groups were formed at this stage, or when groups were formed at weaning.

Regrouping pigs at the start of the finishing period led to significant increases in aggressive behaviour during the post mixing period, but did not significantly affect production performance during the finishing period.

The results show that forming uniform weight groups at the start of the finishing period results in more efficient use of finishing accommodation. However, regrouping is associated with increased aggression, which has negative welfare implications. It is suggested that future research should concentrate on reducing variability in growth during the growing period so that forming uniform weight groups at weaning leads to reduced within-group variation in slaughter weight.

2. INTRODUCTION

Many producers are opting to keep weaned pigs in the same group from weaning until slaughter in order to minimise stress and labour associated with regrouping. However, this practice may lead to high within-group variation in slaughter weight. This, in turn, can lead to inefficient use of space in finishing accommodation. This is due to the fact that some pigs in the group will reach slaughter weight before others, thus leaving pens half-empty. In addition, in cases where entire groups of pigs are sent for slaughter simultaneously, then increased variability in slaughter weight will result in increased variability in carcass characteristics (Walker, 2002).

It may be possible to reduce within-group variation in slaughter weight through forming uniform weight groups when pigs are being regrouped. However, earlier work suggests that social factors will result in some pigs growing faster than others (O'Connell and Beattie, 1999), thus eliminating the effect of forming uniform groups. In addition, chronic aggression associated with unresolved dominance relationships within uniform weight groups (Anderson *et al*., 2000) may have a negative effect on growth performance (Stookey and Gonyou, 1994).

The aim of the current study was to assess the effect of creating uniform weight groups at weaning at 4 weeks of age on performance during the growing and finishing periods, and on within-group variation in slaughter weight and carcass parameters. An equal number of pigs were also regrouped at the start of the finishing period at 10 weeks of age in order to assess whether forming uniform weight groups at this stage had additional benefits in terms of reducing variation in slaughter weight. In addition, the effect of regrouping pigs at 10 weeks of age on mean performance and aggressive behaviour was also assessed.

3. MATERIAL AND METHODS

3.1 Treatments

One thousand two hundred pigs were assigned to one of the following five treatments:

1. Uniform weight groups formed at weaning and retained until slaughter.
2. Mixed weight groups formed at weaning and retained until slaughter.
3. Uniform weight groups formed at the start of the finishing period and retained until slaughter.
4. Mixed weight groups formed at the start of the finishing period and retained until slaughter.
5. Mixed weight groups formed at weaning and mixed at the start of the finishing period to form mixed weight groups, which were retained until slaughter (used to assess the effect of regrouping at 10 weeks of age when compared with Treatment 2).

Three groups of ten pigs were assigned to each treatment. In the case of uniform groups, these consisted of one group of small pigs, one group of medium pigs and one group of large pigs. In the case of mixed weight groups, these consisted of three groups each containing equal numbers of small, medium and large pigs.

Pigs were weaned at 4 weeks of age at an average weight of 9.7 kg. The average weight of small, medium and large groups at 4 weeks of age was 7.9, 9.7 and 11.4 kg, respectively. Groups formed at 10 weeks of age had an average weight of 30.5 kg. The average weight of small, medium and large groups at 10 weeks of age was 25.7, 30.8 and 34.5 kg, respectively. Within-group range in body weight in uniform and mixed weight groups formed at either 4 or 10 weeks of age is presented in Tables 1 and 2. Each group was balanced for gender. Pigs moved to finishing accommodation at 10 weeks of age and were slaughtered at 21 weeks of age.

3.2 Housing

During the growing phase from 4 to 10 weeks of age, pigs were housed in combined stage 1/stage 2 accommodation with plastic slatted floors and a space allowance of 0.38 m^2 per pig. One four-space feeder supplying dry feed and a separate drinking bowl was provided per group. Temperature was 28°C for the first day post-weaning, and was then reduced by 0.5°C per day to 19°C where it remained for the remainder of the growing period.

At 10 weeks of age pigs were transported a distance of approximately 1 km to finishing accommodation. Transportation took place between 0900 and 1100 hours.

During the finishing period pigs were housed on fully slatted floors at a space allowance of 0.61 m^2 per pig. Each group of pigs was fed from one single-space feeder supplying both feed and water. Throughout the experimental period, pigs were offered standard pelleted diets on an *ad libitum* basis.

3.3 Parameters measured

Pigs were individually weighed at weaning at 4 weeks of age, and at 10 and 21 weeks of age. Individual growth rates and group feed intake and food conversion ratios were calculated for the growing period (4 to 10 weeks of age) and the finishing period (10 to 21 weeks of age). Carcasses were weighed at the abattoir, and backfat measurements were taken at the P_2 position using an optical probe. Within-group range in body weight and carcass parameters was calculated by subtracting the value for the lightest pig in the group from that for the heaviest pig.

The behaviour of each group of pigs was observed five times per day over the two-day period immediately after pigs moved to finishing accommodation. During each observation, the frequency of occurrence of aggressive behaviours, such as fighting, biting, headthrusting, chasing and displacing from the feeder or drinkers, was recorded for a 1-minute period. The total frequency of aggressive behaviours during the 2-day post-mixing period was calculated.

4. RESULTS AND DISCUSSION

4.1 Effect of regrouping strategy used at 4 weeks of age

Within-group range in body weight remained lower in uniform than in mixed weight groups at 10 weeks of age ($P<0.01$) (Table 1). However, by the time the animals reached slaughter weight (at 21 weeks of age), there were no significant differences in within-group range in weight between uniform and mixed weight groups. Production performance during the growing and finishing periods did not differ significantly between uniform and mixed weight groups ($P>0.05$) (Table 1).

These results show that there are no benefits in forming uniform weight groups at weaning in terms of reducing within-group range in weight at slaughter. Previous research suggested that there may be particular benefits for small pigs of being housed separately from large pigs during the growing period, in terms of gaining adequate access to feed (O'Connell *et al*., 2004). However in the current study, growth rates during the growing period of small pigs within uniform weight groups and within mixed weight groups were identical (growth rate of 471 g/day for small pigs in both group types).

Table 1 Mean range in body weight and carcass parameters, and production performance in groups formed at 4 weeks of age

	Uniform	Mixed weight	SEM	P
Within-group range				
4 week weight (kg)	2.03	4.58	0.111	<0.001
10 week weight (kg)	12.13	14.19	0.674	<0.01
21 week weight (kg)	35.29	33.38	2.440	NS
Carcass weight (kg)	23.42	23.14	1.651	NS
Backfat (mm)	6.95	7.62	0.639	NS
Mean production performance				
Growing period (4-10 weeks)				
Feed intake (g/day)	758.2	757.8	8.39	NS
Growth rate (g/day)	507.5	511.4	5.53	NS
Food conversion ratio	1.49	1.48	0.012	NS
Finishing period				
Feed intake (kg/day)	2.15	2.15	0.045	NS
Growth rate (g/day)	825.8	832.1	10.74	NS
Food conversion ratio	2.60	2.58	0.046	NS
21 week weight (kg)	98.31	99.34	0.936	NS
Carcass weight (kg)	73.63	74.69	0.735	NS
P_2 backfat (mm)	11.43	11.50	0.252	NS

Although within-group range in weight remained higher in mixed weight than in uniform weight groups at 10 weeks of age, the range in weight within uniform groups increased substantially during the growing period. In general, growth rate appeared more variable during this period than in the finishing period. For example, within-group range in weight in uniform groups increased by a factor of 6 during the growing period, but only by a factor of 3 during the finishing period. It is likely that increased variation in growth during the post-weaning period reflected differing abilities of pigs to cope with the weaning process.

4.2 Effect of regrouping strategy used at 10 weeks of age

Forming uniform weight groups at 10 weeks of age led to reductions in within-group range in slaughter weight ($P<0.01$) and carcass weight ($P<0.1$), and did not significantly affect production performance (Table 2). Mean levels of aggressive behaviour during the post-mixing period did not differ significantly between uniform and mixed weight groups ($P>0.05$).

These results show that within-group range in slaughter weight can be reduced by 7 kg through forming uniform groups at the start of the finishing period. Walker (2002) suggested that observed differences in slaughter weight of pigs did not always translate into differences in carcass weight. However, in the present study, within-group range in carcass weight was 3 kg lower when uniform groups were formed at 10 weeks of age than when balanced groups were formed at this age, or when groups were formed at weaning at 4 weeks of age (see Table 1). Therefore, in production systems which operate a 'group in/group out' regime in finishing

accommodation, forming uniform weight groups at the start of the finishing period will result in less variation in carcass weight.

Table 2 Mean range in body weight and carcass parameters, and production performance in groups formed at 10 weeks of age

	Uniform	Mixed weight	SEM	P
Within-group range				
10 week weight (kg)	6.86	13.54	1.188	<0.001
21 week weight (kg)	26.35	33.62	3.093	<0.01
Carcass weight (kg)	18.61	21.50	2.093	<0.1
Backfat (mm)	7.24	7.00	0.810	NS
Mean production performance				
Feed intake (kg/day)	2.13	2.15	0.057	NS
Growth rate (g/day)	821.1	818.9	13.61	NS
Food conversion ratio	2.60	2.63	0.059	NS
21 week weight (kg)	97.67	97.27	1.186	NS
Carcass weight (kg)	74.01	73.25	0.931	NS
P_2 backfat (mm)	11.32	11.51	0.319	NS

In production systems which operate on the basis that pigs are sent for slaughter as soon as they reach a target slaughter weight, then forming uniform weight groups at the start of the finishing period will lead to more efficient use of finishing accommodation. This is due to the fact that the time taken for all pigs in the group to reach a target slaughter weight is reduced by 1 week if uniform weight groups formed at 10 weeks of age. This is based on the assumption that growth rate of pigs at this age is approximately 995 g/day (Weatherup *et al*., 1998). Therefore, in mixed weight groups it will take approximately 5 weeks for all pigs to reach target slaughter weight (due to within-group weight range of 34 kg), whereas in uniform weight groups it will take approximately 4 weeks for all pigs to reach slaughter weight (due to within-group weight range of 26 kg).

Uniform groups of small, medium and large pigs formed at 10 weeks of age weighed 90, 99 and 104 kg at 21 weeks of age, and had carcass weights of 68, 75 and 79 kg, respectively. If target slaughter weight is 99 kg (for target carcass weight of 75 kg), then groups of large pigs would be slaughtered at 20 weeks, medium pigs at 21 weeks and small pigs at 22 weeks of age. Mixed weight groups, or groups formed at weaning, would be slaughtered at 21 weeks of age. These results suggest that large groups will all reach slaughter weight 2 weeks earlier, and medium weight groups will all reach slaughter weight 1 week earlier, than mixed weight groups. Groups of small pigs should all reach slaughter weight at the same time as groups of mixed weight pigs. These results are presented in Table 3. They suggest that forming uniform weight groups at 10 weeks of age will result in three additional pen weeks in finishing accommodation.

Table 3 Effect of forming uniform weight groups (small, medium, large) at 10 weeks of age on use of finishing accommodation

	Mean slaughter age	Pen clearing time	Additional pen weeks
Mixed weight (control)	21 weeks	5 weeks	0
Small	22 weeks	4 weeks	0
Medium	21 weeks	4 weeks	+1 week
Large	20 weeks	4 weeks	+2 weeks

4.3 Effect of regrouping at 10 weeks of age on aggression and performance

A major concern associated with regrouping pigs at the start of the finishing period is the effect that it will have on levels of aggression, and on subsequent performance during the finishing period. In the current study regrouped pigs showed significantly more aggressive interactions during the two-day post-mixing period than non-regrouped pigs (regrouped: 0.95; non-regrouped: 0.45; SEM 0.153/min; $P<0.05$). However, growth rate, feed intake and food conversion ratio during the finishing period did not differ significantly between regrouped and non-regrouped pigs ($P>0.05$).

The increased aggression shown among regrouped pigs concurs with previous research (Francis *et al*., 1996), and reflects the establishment of social relationships. These effects appear to be transient, and do not have a long-term effect on performance. However, acute stress associated with aggression can suppress the immune system, thereby making pigs more susceptible to disease (Hessing and Tielen, 1994).

5. CONCLUSIONS

- Forming uniform weight groups at the start of the finishing period makes more efficient use of finishing accommodation

- However, regrouping finishing pigs leads to acute aggression which has negative welfare implications, and could adversely affect health

- Future research should concentrate on reducing variability in growth during the growing period, so that formation of uniform weight groups at weaning leads to reduced within-group variation in slaughter weight

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