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Growth Performance and Digestive and Metabolic Responses of Finishing Gilts Penned Individually or in Groups

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Summary and Implications

An experiment was conducted using one or four finishing gilts/pen to identify factors related to the lower performance of pigs penned in groups. Feed intake, daily gain and final weight were greater in pigs penned individually. There was a trend for greater loin weight and primal cut percentage for pigs penned individually. Apparent digestibilities of dry matter, crude protein and gross energy and the plasma concentrations of urea, glucose and nonesterified fatty acids were similar for both individually and group-penned pigs. These results suggest the lower performance of group-penned pigs is related neither to changes in digestive processes nor plasma metabolite concentrations.

Introduction

Pigs raised in commercial conditions are normally penned in groups. In nutrition and other experimental studies, however, they are frequently penned individually. Researchers often pen pigs individually to increase the number of times a treatment can be replicated in an experiment. Increas-

ing the number of replicates/treatment reduces experimental error.

Previous research indicates growth performance is improved when pigs are penned individually compared to when they are grouped. Both competition and aggressive behavior are related to reductions in feed intake and weight gain in group-penned pigs. However, little is known about the changes in body composition or digestive and metabolic responses arising from the social interactions in group-penned pigs compared with those individually-penned. These differences should be investigated to not only refine nutritional recommendations but also to identify conditions in group pens which limit productivity. The present experiment was conducted to identify factors involved in the lower performance of pigs housed in groups.

Procedures

Sixty crossbred gilts with an initial body weight of 100 pounds were allotted to a randomized complete block experiment with two treatments. Two housing treatments were used; one versus four pigs per pen. There were 12 pens with individual pigs and 12 pens with four pigs per pen. One feeder (with one feeding space), one waterer and the same space allowance was offered to each pig, regardless of the number of pigs per pen. The diet was corn-soy-

Table 1. Diet composition (as-fed basis)

Ingredients	Percentage
Corn	72.9
Soybean meal, 46.5% CP	21.5
Tallow	3.0
Dicalcium phosphate	1.1
Salt	.3
Limestone	.4
Vitamin mix	.7
Trace mineral mix	.1

Formulated composition:

Metabolizable energy, Mcal/lb	1.44
Crude protein, %	16.00
Lysine, %	.80
Calcium, %	.65
Phosphorus, %	.55

bean meal-based and fortified with vitamins and minerals to meet or exceed the NRC requirements for 110 to 240-pound pigs (Table 1).

Pigs were housed in an environmentally regulated facility and had ad libitum access to feed and water throughout the experiment. Pigs were weighed and feed intakes were measured weekly to determine average daily gain (ADG), average daily feed intake (ADFI) and the ratio of gain:feed (ADG/ADFI). Pigs remained on the study for 77 days.

Blood samples were taken from each pig at the start of the trial, after the first week and at two-week intervals throughout the experiment. Plasma was obtained and analyzed for urea, glucose and nonesterified fatty acids



Table 2. Growth performance, digestive and metabolic responses of finishing gilts housed individually or in groups^a

Item ^{bc}	Individual	Group
No. of pigs	12	48
Growth performance		
Initial wt, lb	99.7 ± .97	100.3 ± .85
Final wt, lb ^d	264.5 ± 3.80	254.0 ± 3.36
ADFI, lb ^d	6.03 ± .13	5.70 ± .12
ADG, lb ^e	2.15 ± .05	2.01 ± .04
ADG/ADFI	.36 ± .01	.35 ± .01
Carcass characteristics		
Carcass wt, lb	198.2 ± 3.3	191.5 ± 2.6
Ham wt, lb	23.5 ± .55	22.2 ± .43
Loin wt, lb ^d	27.2 ± .36	26.0 ± .28
Shoulder wt, lb	28.0 ± .57	26.4 ± .45
Primal cut wt/carcass wt, % ^d	40.1 ± .54	38.8 ± .41
Lean, % of carcass wt	51.5 ± .61	51.0 ± .46
Digestibility, %		
Dry matter	87.8 ± .31	87.7 ± .27
Crude protein	84.1 ± .48	83.8 ± .42
Energy	87.2 ± .33	87.2 ± .29

^aIndividual= one gilt/pen; Group= four gilts/pen.

^bADFI= average daily feed intake; ADG= average daily gain; and gain/feed= feed efficiency.

^c± standard error of the mean.

^dP < .10.

^eP < .05.

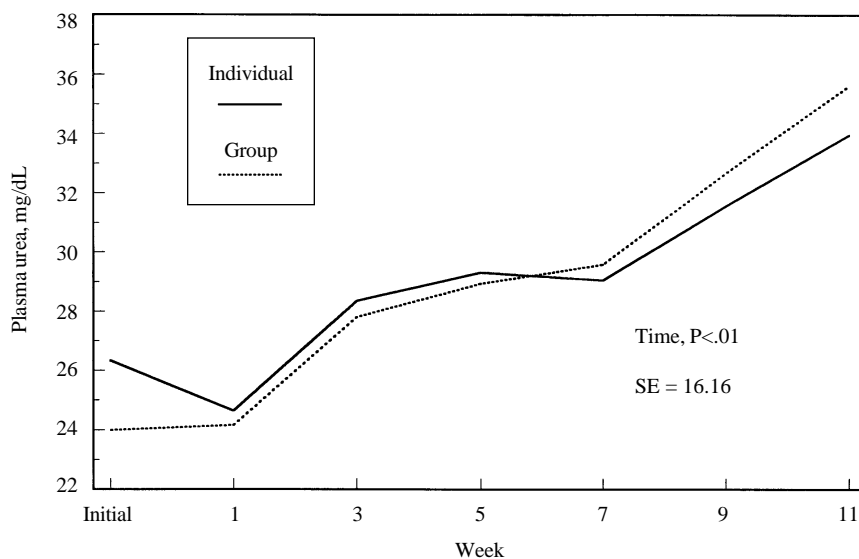


Figure 1. Plasma urea concentration vs time in pigs penned individually or in groups.

(NEFA). The response of each of these metabolites versus week of the study was examined.

During week 6, .25% of chromium oxide (Cr_2O_3) was added to the diet as an indigestible marker and fecal samples from each gilt were collected daily for three consecutive days. Dry matter (DM), crude protein (CP), gross energy (E) and chromium concentration were determined in feed and fecal samples to calculate apparent digestibility of DM, CP and E.

At the end of the experiment, the pigs were shipped to a packer in northwestern Iowa where carcass characteristics were acquired from relationships derived using Total Body Electrical Conductivity (TOBEC). These included ham, loin and shoulder weights, primal cut percentage and carcass lean percentage (5%-fat basis).

Results and Discussion

Results of growth performance, carcass characteristics and apparent digestibility are presented in Table 2. Average daily gain was greater ($P<.05$) and there was a trend for greater final weight and ADFI ($P<.10$) for individually penned pigs. Reduction of feed intake and weight gain in pigs penned in groups is attributed to fighting and aggressive behavior to maintain dominance hierarchy, especially when pigs are eating. Competition during eating periods can distract some pigs from eating, whereas other pigs may be displaced from the feeder by dominant pigs. We assume pigs penned individually ate more and grew faster because of lack of competition at the feeder.

Carcass weight was statistically standardized (used as a covariate) to analyze carcass characteristics. There was a trend ($P<.10$) for higher loin weight and primal cut percentage in pigs penned individually.

Apparent digestibilities of DM, CP and E were similar in both treatments. Because the efficiency of digestion and absorption were similar,

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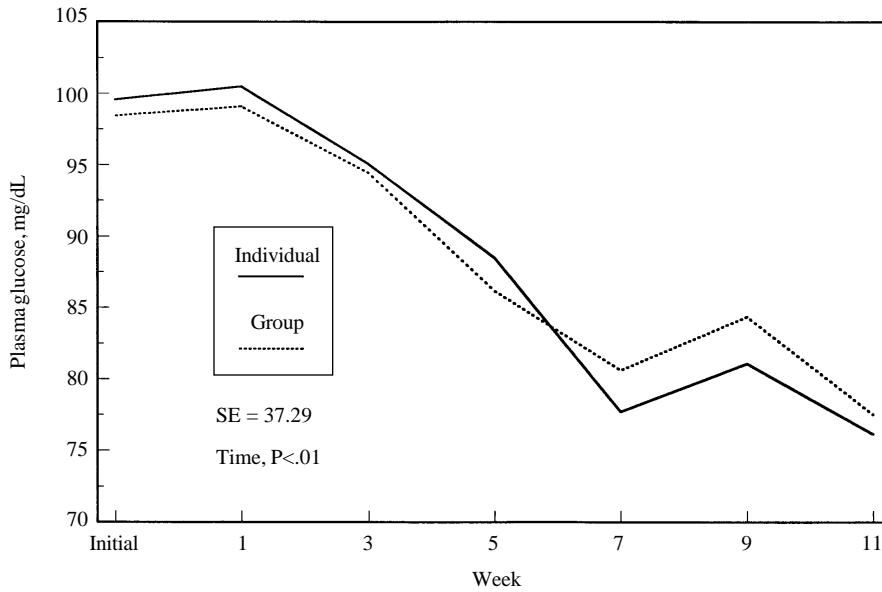


Figure 2. Plasma glucose concentration vs time in pigs penned individually or in groups.

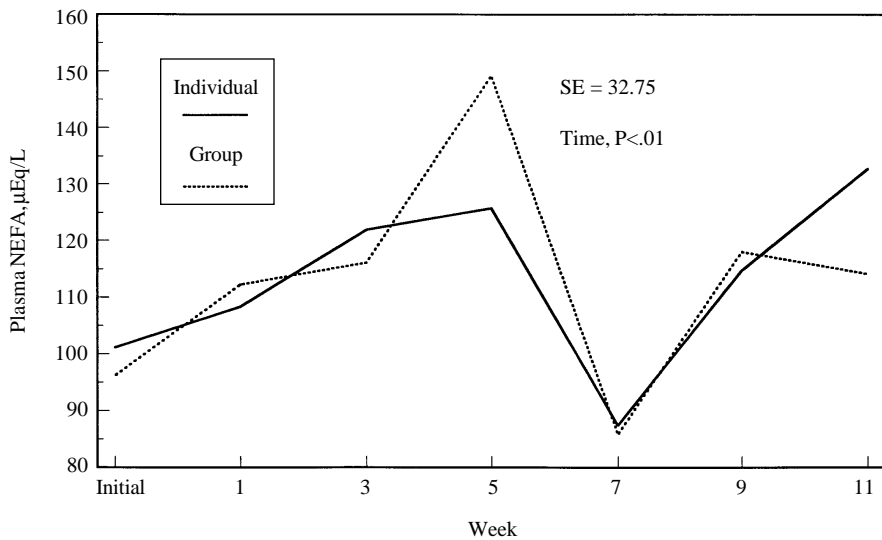


Figure 3. Plasma nonesterified fatty acids (NEFA) concentration vs time in pigs penned individually or in groups.

changes in digestive processes related to housing conditions do not seem to be associated with the lower performance of pigs housed in groups. However, because feed intake was greater for pigs penned individually, more nutrients were absorbed and potentially utilized for tissue accretion.

Increased concentrations of urea, glucose and NEFA in pigs are often symptoms of stressful situations. Stress responses can be triggered by competition and aggressive behavior in pigs penned in groups. However, this is not supported by the responses of plasma urea, glucose and NEFA concentration observed in this study (Figure 1, 2, and 3 respectively). Pigs penned individually or in groups showed similar patterns of plasma urea, glucose and NEFA concentration throughout the experiment.

Conclusions

Growth performance was greater in pigs penned individually than in those pigs penned in groups. The lower performance of pigs penned in groups is not related to changes in apparent digestibility of DM, CP or E or to changes in plasma concentrations of urea, glucose, or NEFA. These observations suggest measurements of feed intake and growth performance data derived from pigs penned individually should be adjusted if they are to be applied to commercial situations or research conditions where pigs are penned in groups.

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