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Effects of Environmental Enrichment and Space Allowance on Agonistic Behavior in Growing Pigs

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Abstract

The objectives of this study were to clarify the effects of environmental enrichment and space allowance on agonistic behavior in growing pigs and to identify the reason for each outbreak of agonistic behavior. Twelve healthy pigs (3 mo old, averaging 50 kg body wt) were kept for 3 days in one of two environments: Group A (6 pigs) had a limited space allowance (8.2 m^2) and minimal environmental enrichment (concrete floor sparsely scattered with wood shavings), and Group B (6 pigs) had a wide space allowance (29.0 m^2) and high enrichment (the floor was generously covered with a depth of about 20 cm of bark).

The pigs changed their posture more frequently under the conditions of a limited space allowance and minimal environmental enrichment. The pigs in Group A engaged in eating and in the manipulation of floor particles more frequently than the animals in Group B. The overall occurrence of agonistic behavior was markedly reduced by increasing the space allowance and enriching the environment. The results of this study show that pigs kept in a narrow space with little enrichment are seldom able to maintain their personal territory and their chewing materials, hence agonistic behavior happens frequently.

Introduction

In the production of pigs, recently the stocking density of the animals has been increasing as a measure of reducing the cost of production and as a labor saving means in the industry. Stocking animals at higher densities adversely reduces each animal's opportunity for exercise and for choice of microenvironment and social companionship. Southwick[6] noted that fighting increased with crowding in populations of mice, and Calhoun[3] described social disintegration and behavioral aberrations in wild rats under high population densities. Ewbank and Bryant[4] reported that reducing the area available per pig resulted in increased occurrences of agonistic behavior within the group.

Studies of pigs have indicated that environmental enrichment could stimulate behavioral patterns similar to that in pigs in semi-natural conditions.[1] Beattie *et al.*[2] showed that environmental enrichment plays a strategic role in curtailing agonistic behavior in pigs grown in a spacious area. Reports available to date, however, do not take into consideration the various types of agonistic behavior in limited space and under limited enrichment conditions.

The present study was made to clarify the effects of environmental enrichment and space allowance on agonistic behavior in growing pigs and to investigate the reasons for each occurrence of agonistic behavior.

Materials and Methods

Twelve healthy pigs (3 months old, 50 kg average body wt) were kept in one of two types of rearing conditions: Six pigs (Group A) were given a limited space allowance (8.2 m^2) and minimal environmental enrichment (concrete floor with a sparse supply of wood shavings), and the other six pigs (Group B) had a wide space allowance (29.0

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m^2) with enhanced environmental enrichment (the floor was generously covered with bark to a depth of about 20 cm). In both groups these experiments were conducted for three successive days. For one-hour (11 a.m. to 12 noon) observation of the behavior of the animals daily, two movie cameras were installed. The posture and behavior of each pig were checked continuously. The postures assumed by the pigs were standing, dog sitting, lying in the lateral position, and lying in the prone position. The types of behavior checked included eating their feed, drinking water, nosing the fixtures, manipulating the floor particles (wood shavings or bark), and resting. Agonistic behavior was analyzed according to the reason for each occurrence, i.e., infringement of personal (occupied) territory, scramble for the manipulation of floor particles, disturbance of rest, and retaliation against an enemy.

Results and Discussion

Postures assumed by the pigs are summarized by frequency in Table 1. In both groups, standing was the most frequent posture observed, and all four postures occurred more frequently in Group A, that is, the pigs housed in the limited space allowance with minimal enrichment.

The Group B-to-Group A ratio of frequency of posture assumed by the animals was 40.5% standing, 36.4% in the prone position, 31.7% lying in the lateral position, and 27.1% dog sitting. During the 1-hour observation period for the 3-day experiments, the average number of posture changes was 42.1 in Group A and 15.3 in Group B. This shows that pigs kept in a small space allowance with minimal environmental enrichment change their posture far more frequently than pigs kept in a wider space with environmental enrichment.

Table 1 Frequency of the several postures assumed by the pigs.[1]

Posture	*Group A* Occurrences	*Group B* Occurrences	B/A Ratio %
Standing	20.0[a]	8.1[b]	40.5
Dog sitting	5.9	1.6	27.1
Lying in the lateral position	6.3	2.0	31.7
Lying in the prone position	9.9	3.6	36.4

[1] average for 3 days (1 hr observation each day)
a, b $P<0.05$

The percentage of time spent per behavior during the observation periods is shown in Table 2. Pigs in Group A spent more time engaged in eating and in the manipulation of floor particles than the pigs in Group B and less time resting.

In both groups, workers took care of husbandry chores such as feeding the animals and/or cleaning the pen at around 8 o'clock to 9 o'clock in the morning and again at around 4 o'clock to 5 o' clock in the afternoon. Normally, activity of the animals was higher at feeding time and/or the time of cleaning the pen[7]. In this study, observation was made from 11 a.m. to 12 noon, a period when the activity of the pigs would presumably be lower than that at feeding time. The pigs in Group A were more active than those in Group B, as shown by the frequency of changing postures, eating, and manipulating the floor particles. This indicates that an enriched environment and wide space allowance shifts the pig's behavior to a more normal pattern.

Table 3 shows the agonistic behavior in relation to frequency and the reason behind the occurrence of that behavior. In Group A, retaliation against an enemy was the most frequent reason for agonistic behavior, followed by infringement of personal territory and scramble for the manipulation of floor particles. Disturbance of the

Table 2 Percentage of time the pigs spent per behavior.[1]

Behavior	*Group A* %	*Group B* %
Eating	14.5	10.8
Drinking water	1.0	1.8
Nosing the fixtures	2.7	3.4
Manipulating the floor particles[2]	39.4	16.3
Resting	42.6	68.1

[1] average for 3 days (1 hr observation each day)
[2] wood shavings (Group A), bark (Group B)

Table 3 Frequency of agonistic behavior shown by reason for the occurrence.

Reason for occurrence	*Group A* Occurrences	*Group B* Occurrences	B/A Ratio %
Infringement of territory	19.3[a]	0.7[b]	3.6
Scramble to manipulate particles	20.0[a]	1.0[b]	5.0
Disturbance of rest	5.3	2.7	50.9
Retaliating against an enemy	25.0[a]	0.3[b]	1.2

a, b $P<0.05$

animal's rest was the least important cause for agonistic behavior in Group A. Conversely, for pigs in Group B the disturbance of rest was the greatest reason for agonistic behavior, whereas the least important cause was retaliation against an enemy. Among the various reasons for agonistic behavior in the young pigs, the frequency of agonistic behavior per reason was less in Group B than in Group A.

The Group B-to-Group A ratio of agonistic behavior frequency differed according to the reason responsible for the behavior in each instance. Infringement of personal territory, scramble for the manipulation of floor particles, and retaliation against an enemy were reduced to less than one-twentieth (< 5%) by the wide space allowance accompanied by environmental enrichment, as shown in Group B. The problem of disturbed rest was alleviated by half in pigs housed in an increased space allowance with an enriched environment.

The differences between Groups A and B were the space allowance and the extent of environmental enrichment. The overall occurrence of agonistic behavior was markedly reduced by increasing the space allowance and enriching the environment. Infringement of personal territory was particularly a problem in the pigs subjected to limited space; and in the group with reduced enrichment the predominant problem was the scramble for the manipulation of floor particles.

In conclusion, pigs kept in a narrow space under minimally enriched conditions were seldom able to maintain their own territory and their chewing materials, hence agonistic behavior happened frequently. Thus, agonistic behavior can be averted, or at least controlled, by increasing the space allowance and enriching the environment.

References

1) Beattie, V.E., 1994. The effect of environmental enrichment on the domestic pig. Ph.D. thesis, The Queen's University of Belfast, Northern Ireland.
2) Beattie, V.E., N. Walker and I.A. Sneddon, 1996. An investigation of the effect of environmental enrichment and space allowance on the behaviour and production of growing pigs. Appl. Anim. Behav. Sci., 48: 151-158.
3) Calhoun, J.B., 1962. Population density and social pathology. Svient. Am., 206: 139-148.
4) Ewbank, R. and M.J. Bryant, 1972. Aggressive behaviour among groups of domesticated pigs kept at various stocking rates. Anim. Behav., 20: 21-28.
5) Houpt, K.A., 1991. Biological Rhythms and Sleep. In Domestic Animal behavior, pp. 75-103. Iowa State University Press, Iowa.
6) Southwick, C.H., 1955. Regulatory mechanisms of house mice populations: social behaviour affecting litter survival. Ecology, 36: 627-634.

要　約

飼育密度および敷料の有無が育成豚の敵対行動の発現に及ぼす影響を，敵対行動を発生原因ごとに分類し検討した。12頭(約3カ月齢，平均体重50 kg)の育成豚を2群に分け，飼育密度が高く敷料のほとんどない環境（グループA）と飼育密度が低く敷料が潤沢にある環境(グループB)で飼育した。グループAの育成豚は，観察中の姿勢変化が多かった。また，グループAでは敷料の噛み行動や採食行動が多かった。休息の妨害を原因とする闘争行動を除き，グループBにおける各原因ごとの闘争行動の発現回数はグループAの5％以下でしかなかった。