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The influences of group size on behavioral vices and cannibalism

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Introduction

“The frequency of tail biting is known to be higher in units with large numbers of pigs per pen and high stocking densities.”¹

This quote would suggest that the topic of this paper has already been thoroughly researched and that the answer is well known to knowledgeable persons in the swine industry. Although tail biting is not, strictly speaking, cannibalism, nor the only behavioral vice in pigs, it serves as the focus of undesirable behaviors we see in grower/finisher pigs. The above quote appears in several other publications by the same co-authors, and its sentiment is repeated in most discussions on the causes of tail biting. Large group sizes are a causative factor in behavioral vices in grower/finisher pigs. Yet few of these statements are accompanied by a reference to scientific study or documented clinical observations. I have not been able to obtain a copy of the one paper cited in which increasing group size from 8 to 32 pigs per pen was associated with an increase in the incidence of tail biting.^{2,3} As with many statements about tail biting, we are left to question if what is “known” is really true.

Behavioral vices are notoriously difficult to study. Their incidence is often sporadic and attempts to induce them often fail. Lack of fiber in the diet has been listed as an explanation for tail biting⁴ but has failed to induce the problem in a subsequent controlled study.⁵ Large numbers of animals are required to demonstrate differences due to individual factors such as sex, but even more when pen factors such as group size or room factors such as ammonia levels are studied. It is quite understandable that few experimental studies have examined the effects of group size on behavioral vices but surprising that such definitive statements appear in print.

Group size is a particularly difficult factor to study in animal management. The importance of experimental units, rather than absolute number of animals, has driven most research toward small groups. Nutritional studies are often conducted on groups of five or fewer pigs per pen. A review of group size effects on productivity of grower/finisher pigs included several studies with groups of 30–40 pigs,⁶ but such groups are no longer considered large by commercial standards. We have observed that

the social hierarchy in groups of pigs changes from being very linear to somewhat complex (non-linear) as group size increases from 3 to 15 pigs.⁷ Using linearity as an indicator of stability, it has been suggested that pigs cannot maintain a stable hierarchy in groups larger than 25–30.³ The use of very large group sizes in poultry may be possible due to the development of social tolerance, rather than a stable hierarchy.⁸ I would suggest that in pigs we have a very stable, linear social group in pens containing up to 15–25 pigs. Medium sized groups, perhaps 20–40 pigs, probably represent a transition in which pigs attempt to form a single hierarchy that never achieves stability. At some point, large groups become tolerant of unfamiliar pigs and may form social subgroups within which most social interactions occur. We have observed that in a group of 30–40 pigs there are several “sleeping” subgroups, as pigs generally return to the same location for lying. As group size increases to more than 200 in a group, pigs develop stronger location preferences and are less likely to form strong associations with other pigs.⁹ The relative instability of groups of 20–40 pigs has been cited as a cause for behavioral vices,³ but we must expand our considerations of group size to include the “tolerant” structure of much larger groups. The implications for behavioral vices in such large groups may be quite different.

Factors contributing to tail biting

Every discussion of tail biting includes a list of several factors believed to be related to the incidence of the behavior. A relatively recent review suggests floppy ears, spindle penning, overcrowding, poor quality protein, low fiber diets, carbon dioxide, ammonia, high humidity, lack of straw, and a high proportion of slatted floor are associated with higher frequencies of tail biting.¹⁰ I generally use three categories of contributing factors: nutrition, discomfort, and lack of enrichment. Nutrition was once considered the primary cause of vices, but is usually only implicated today if feed mixing errors have occurred. Nutrition is unlikely to be related to differences in behavioral vices associated with group size.

Several environmental features may cause discomfort. Of relevance to group size is the question of social structure

and social facilitation. As indicated above, the instability of the social hierarchy in medium sized groups may contribute to social stress and contribute to discomfort. We are less sure of what happens within very large groups. A strategy of social tolerance would reduce the stress of encountering other pigs during routine social interactions. However, the possibility exists that some pigs fail to adopt such a strategy and remain stressed by the large number of unresolved relationships within their pen. A second type of social influence on behavioral vices is social facilitation. If the victim of a behavioral vice becomes a stimulus and focal point of that vice, then it is more likely to be victimized to the point of severe injury in large groups than in small. A tail-bitten pig will attract the attention of pigs that were not previously involved in tail biting. More pigs will be attracted in a large group, and the victim may soon be severely injured.

Factors confounded with group size

Questions posed about group size often refer to management systems that happen to include larger group sizes. It is important to recognize that other environmental features are confounded with the number of pigs in a pen. "Group size" statements often confound group size and space allowance. Adding three additional pigs to a pen of 12 increases group size, but more importantly it reduces space allowance by 20%. In general, the reduction in space allowance is far more important than the increase in group size. Other resources may also be involved in the "group size" effect. Increasing the number of pigs may be confounded with feeder space or pigs per drinker. If the room is operating near its ventilation capacity, increasing the number of pigs may result in higher temperatures, humidity, or gas levels.

The use of very large groups, particularly in the United Kingdom, is often confounded with floor and bedding management. Many large group systems have been developed using renovated facilities which have solid floors and use straw bedding. Both of these features will reduce the incidence of behavioral vices apart from any group size effect. Within North America we have seen large group sizes used in hoop structures, where a soil base and fibrous bedding would reduce behavioral vices through enrichment of the environment. The natural ventilation of open front barns or yards could also be a part of any "group size" effect when such systems are compared to conventional slatted floor and mechanically ventilated barns.

Large group systems and behavioral vices

We see several large group systems in development and in use on commercial farms today. The level of behavioral problems will likely differ within each variation of large group housing. Reports of tail biting and other problems are largely anecdotal, but we have enough information that we can speculate on the likelihood of problems.

Two systems have developed within the United Kingdom. The first involves renovation of older facilities. These systems will have solid floors and use a deep bed of straw. These facilities fit well with low capital outdoor gestation and farrowing systems, and often house "outdoor" pigs. Inquiries suggest that the level of tail biting and other vices in these systems is low (S. Edwards, personal communication). However, if tail biting does occur, it should be attended to quickly to prevent a rapid spreading of the problem. The second system is used in the United Kingdom is newly constructed facilities designed for large groups. Pens usually have a high proportion of solid floor and some straw is provided. The pens are designed to have well defined and multiple dunging, eating, and resting areas. Again, the presence of solid floor and straw are likely to keep behavioral vices low.

Within North America we see interest in two other systems. Hoop structures are a low capital alternative to conventional confinement facilities. The units are stocked with 150–200 grower/finisher pigs, often in a single group. The floors are dirt or solid concrete, and some sort of bedding is usually provided. The structures are well ventilated during much of the year. Many reports comment on a high level of health and freedom from behavioral vices in these structures. I have been told that occasionally a pig is lost following the first sorting for market. This may be due to social stress, or to the sorting and handling procedures. As with the renovated facilities in the United Kingdom, we would expect a low level of behavioral vices due to the enriched environment.

We are also seeing interest in the construction of new facilities that are conventional in all aspects except group size. The floors are fully slatted and no straw is used. However, pigs are kept in groups of over 100 animals. It is in these units that we would expect to see the highest level of tail biting and any detrimental effects of group size. The slatted floors would contribute to the discomfort factor associated with tail biting, while the lack of fibrous bedding would reduce the environmental enrichment. However, pigs have more freedom to move about and select a micro-environment within the pen which suits them. A concern I have for such a system is that producers will stretch the system by adding more pigs with each fill, until overcrowding induces an outbreak of behavioral problems. Although most large group facilities would be

built without internal penning, some producers have created a maze system. An early use of large groups in an enclosed building included solid concrete partitions that formed a maze.¹¹ Only a few pigs were in sight of each other at one time. No social problems were reported. Another producer has built a typical grower/finisher barn, complete with solid pen divisions, but leaves the gates open to all pens (K. Keller, personal communication). Pigs are able to move about freely until they are weighed and sorted for the first marketing. Tail biting among the first few groups in the system has been very low.

Summary

Large group sizes are being considered for grower/finisher pigs to make more efficient use of space and equipment. Our understanding of pig social behavior in large groups is limited, but we speculate that a transition in social structure may occur in these large groups. Large group systems often use management practices such as solid floors and bedding which would be expected to reduce tail biting and other vices. Even when large groups are housed on fully slatted floors, pigs may be able to improve their degree of comfort by selecting a better micro-environment within the pen. Based on recent discussions with producers, the level of behavioral vices is not increased in large groups provided space allowance is maintained. However, it is probably more important to react to an outbreak of tail biting or other vices quickly in order to reduce its spread in the pen.

References

1. English, PR, et al., *The Growing and Finishing Pig: Improving Efficiency*. Ipswich, United Kingdom: Farming Press Books; 1988–268.

2. Petersen, ES and EK Nielsen, Flokstorrelsens indflydelse pa slagtesvins produktionsevne. SBI-Landbrugsbyggeri 49, Statens Byggeforsknings-institut. As cited by: Hansen and Hagels0.³
3. Hansen, LL and AM Hagelso, Environmental influence on the social hierarchy function in pigs. *Proc 30th Ann Meet Euro Assoc Anim Prod*. 1979; Harrogate, England; 1–7.
4. Ewbank, R. Tail-biting in pigs: A behavioural disease? *Vet Rec*. 1968; 83: 635.
5. Ewbank, R. Abnormal behaviour and pig nutrition. An unsuccessful attempt to induce tail biting by feeding a high energy, low fibre vegetable protein diet. *Br Vet J*. 1973; 129: 366–369.
6. Kornegay, ET and DR Notter, Effects of floor space and number of pigs per pen on performance. *Pig News Inform*. 1984; 5: 23–33.
7. Moore, CM, et al., The influence of group size and floor area space on social organization of growing-finishing pigs. *Proc 30th Intl Cong Intl Soc Appl Ethol*. 1996; 34.
8. Estevez, I, et al., Further evidence of the tolerant social system in the domestic fowl. *Proc Intl Soc Appl Ethol N Amer* 1998; East Lansing, MI: 21.
9. Penny, PC, et al., The behaviour of high and low performing pigs and location preferences in large groups of pigs housed on deep bedded straw. *Proc Brit Soc Anim Sci*. 1997; 112.
10. Arey, DS. Tail-biting in pigs. *Farm Building Prog*. 1991; 105: 20–23.
11. Nehring, A. One answer to the confinement pig problem. *Int J Stud Anim Prob*. 1981; 2: 256–259.

