factsheet
Pork Information Gateway

Sows and Space

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Introduction

Pork producers have both economic and ethical incentives to understand the amount of space that meets the anatomical and behavioral needs of the pig. It is not enough to say pigs need more space on purely anthropomorphic grounds. We must understand how science has defined space needs of pigs. Still, some people may impose ethical or perceptual requirements about how much space should be provided that differs from purely science-based requirements. This paper will firstly consider how various groups' view the space provided to pigs and secondly address the various ways in which space requirements have been defined based on science.

Historical Perspective on Space Requirements

In 1965, a group established by the British government and led by the zoologist F. W. Rogers Brambell examined the welfare of farm animals. They concluded that animals have five basic freedoms. These include the freedom to get up, lie down, turn around, stretch their limbs and groom (lick or rub itself or others; Hurnik et al., 1995). At the time (and to this day), some animals in some circumstances do not have enough space to meet these five freedoms. The Brambell's report on the "Five Freedoms" is not specifically recognized by any authoritative body in the USA. However, the USDA does regulate animals used in research and for exhibition, and for these animals the USDA awards similar "freedoms." The USDA requires that regulated species (animals used in research and for exhibition) must be able to turn about freely, to stand, sit, lie in a comfortable, normal position and to walk in a normal manner (USDA, 2002). What the Brambell report (1965) and the USDA are saying, for exhibition and animals used in research, is that they should be given enough space to be able to make "normal postural adjustments." The rules espoused in the Brambell report and the USDA Animal Welfare Act (1966), used common sense logic or human perception because current scientific data were not available.

Some people interpret "adequate" space quite differently. For example, one could provide nough space for sows to make normal postural adjustments except turning around and there are scientific studies that support this amount of space as adequate. To make some sense out of different views we should examine what scientific studies have reported about space requirements for animals.

Static, Dynamic and Social Space

Animals can be said to have three types of space requirements: static, dynamic and (or) social space requirements. If one provides enough space for the sow's body to be contained, then one has met her static space requirement. If more space is given so that all body movements can be accommodated, then the

dynamic space requirement is met. If animals are in a social group, then the social space allowance provides space for unimpeded social interactions.

Static Space Requirement can be determined by direct measurement (ex. tape measures and calipers that directly measure body dimensions). These measures have been collected and important regression equations have been reported that, describe each sow dimension. From these equations one can predict the average dimension of several body features. If one provides enough space for the sow's body to be contained, then one has met her static space requirement.

Yet caution should be exercised because the "average" sow may not reflect the requirements of the smaller or larger individual sows (Figure 1). Thus, some indication of the variation in sow body size must also be determined. Furthermore, stage of pregnancy and feeding levels on farms will influence the size of sows (Figure 1). A typical gestation stall may have an inside dimension of 22 inches (56cm), (24 inches (61cm) center to center), by 7 feet (2m) long with a height of 40 inches (102cm). Note that the body of a large sow weighing 660lb. (330kg) will be contained in a stall that is 17 inches wide (43cm), 6.5 feet (1.9m) long and has a height of 3.4 feet (1m). Thus, a 2 by 7-foot stall (0.6 x 2m) could easily meet the static space needs of a 660lb. (300 kg) sow.

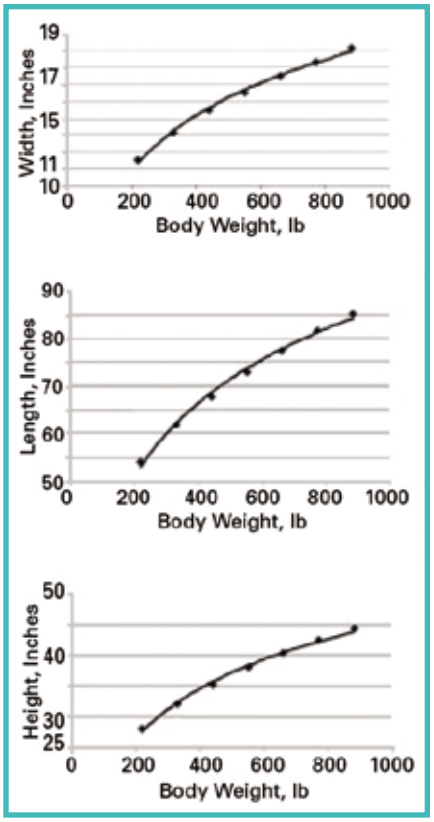

Figure 1. Relationships between body weight and body dimensions (or static space requirements) of the domestic pig. The top graph is body width at its widest point, the middle is body length and the bottom is body height. Data are from Baxter (1984).

Dynamic Space Requirement is the space that a sow needs to make postural adjustments without interference from the walls of the enclosure. The dynamic space requirement is determined by a quantitative photographic or metric analysis of the space occupied when sows are standing up or lying down or making other postural movements. Baxter (1984) and Curtis et al., (1989) evaluated the dynamic space needs of sows. They filmed sows making postural adjustments such as standing and lying down and then estimated the space required by the sows to make these adjustments. Regression equations were generated to estimate the dynamic space needs of sows.

As an example, Curtis et al., (1989) found that sows at 550lb. (250kg) body weight required a pen (or stall) width of 18.3 inches (46.5cm) to meet their dynamic space requirements or in other words to make unobstructed (without touching the sides of the stall) postural adjustments. When Curtis et al., (1989) discussed the space in stalls, they did not consider the feeder to be a part of the floor space that allowed for unobstructed movements. Thus, the estimates of dynamic space requirement for sows were made in space not including the feeder, waterer or other obstructions that might be in a stall or pen. Estimates of dynamic space requirements generated by Curtis et al., (1989) are given in Table 1 for sows of various sizes. Internal pen obstructions should be added to these values if they enter the space needed for dynamic space body movements.

Marchant and Broom (1996) examined the time required to stand up or lie down for sows in stalls compared with sows in a single electronic sow feeder pen. Sows in stalls increased the time required to stand up and lie down as their body length increased. The authors interpreted this as an indication that larger sows had "difficulty" in movement when standing up or lying down quickly. However, alternative explanations are that older or larger sows may require more time to stand up or lie down, or that larger sows kept individually are not in a hurry to stand up or lie down due to reduced social pressures. In support of alternative explana-

lb.	kg	Length		Length		Height	
		cm	inches	cm	inches	cm	inches
330	150	73.7	29.0	191.1	75.2	89.2	35.1
440	200	80.6	31.7	207.0	81.5	94.6	37.2
550	250	86.4	34.0	220.3	86.7	99.0	39.0
660	300	91.4	36.0	231.8	91.3	102.8	40.5

Table 1. Estimates of dynamic space requirement for sows of various sizes based on Curtis et al., (1989).

tions, Harris and Gonyou (1998) found that when individually housed lactating sows were given more room in their stall the larger stalls did not facilitate posture-changing behaviors and in fact the wider stalls appeared to be less comfortable.

Social Space Requirement is less well defined in the scientific literature and has not been determined using a systematic approach. However, space needs for full social interactions of sows are probably provided if the space allowances in the Swine Care Handbook (NPB, 2003) are met. To provide for the "social space" requirements of the sow there is a need to include more than the requirement for simple social interaction. When in a group pen, sows strive to establish separate areas for lying, feeding, drinking and elimination of urine and feces. Sows can socially interact to varying degrees with 14-20ft^2/sow (1.3m^2 to 1.9m^2/sow).

Interestingly, if the dynamic space needs of each sow are met, and if sows are in a group of five or more sows), they should have the ability to socially interact in a normal manner. In one study of space needs of group-housed sows, the number of lesions due to social stress was increased when less than 25ft^2/sow (2.4m^2/sow) were given to group housed sows (Weng et al., 1998). However, the authors cautioned that their study could not be generalized to different group sizes or feeding methods.

Pigs are social animals and they share resting space when group housed leaving some free or unoccupied space. For example, as group size increases in finishing pigs (from 5 or more the amount of free or unoccupied space increases (McGlone and Newby, 1994). The dynamic space allowance of individual sows is greater than the space needed per sow for social interactions. In all likelihood the total space could therefore be reduced with larger group sizes without negatively impacting each individual sow's ability to move within the dynamic space requirement.

Conclusion

Further research must define the space requirements for group housed sows, but for now, all that can be predicted is that the total space required for group-housed sows will be less than the sum of the individual sow dynamic space requirements but more than the static space requirements. Data are not currently available for sow static and dynamic space requirements using modern genetics and production systems.

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