Indoor Gestation Systems for Group Housed Sows

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In 1991, Leo den Hartog [1] presented a summary of research, conducted primarily in his lab in The Netherlands, on various housing systems for gestating sows. In his concluding statements he indicated that, "modern group systems are relatively new developments and are likely to improve rapidly as efforts are directed toward controlling problems such as aggression, claw disorders, and manageability of sows." Now, 15 years later, the North American industry continues to consider if it is advisable to change to group housing. The AVMA [2] recently commissioned a task force to review housing for pregnant sows. In their summary they stated that productivity of sows in stalls does not differ from that of sows kept in groups. Although they concluded that sow injury was greater in group systems, referring to post-grouping aggression, and that other aspects of health were predominately affected by factors other than housing system.

Both den Hartog [1] and the AVMA task force [2] based their conclusions on 'groups' vs stalls. However, group systems vary greatly in terms of how sows are fed and managed. In this presentation I will look at several studies on sow housing, but I will try to examine some of the details that are often overlooked in large reviews. The studies I have selected represent a variety of systems, and differences in management within some of the systems as well.

Stalls, Feeding Stalls, and ESF

A series of studies on sow housing was conducted at Cambridge University [3,4,5]. The basic housing systems used were stalls (2 x 0.6 m), small groups (5 pigs) fed from individual feeding stalls, and a group of 37 in an electronic sow feeding system (ESF). The two group systems used are recognized as providing the best control over individual feed intake of the various group housing systems. Sows remained in their treatment through four gestations. Behaviour observations were made during both the 1st and 4th gestation cycle for these sows. Not unexpectedly, agonistic interactions were more frequent in the two group systems during the first gestation. However, in the 4th gestation the stall sows had similar levels of agonistic behaviour and higher overall levels of social interactions with their neighbours than did the group sows. Within the stalls, social interactions during the 4th gestation frequently escalated to the point that aggression (eg a slash at the neighbour) would occur. Within the group systems social interactions usually resulted in a sow avoiding another, and rarely escalated into aggression. Most encounters

in both of the group systems resulted in a clear outcome, while those among neighbours in stalls did not. We recognize that aggression is high among newly re-grouped sows, but the study demonstrated that social behaviour in groups stabilizes over time while that among sows in stalls does not. The protection that stalls afford sows in stalls from aggression related injuries probably also prevents the stabilization of their social behaviour.

A second aspect of the sows' behaviour involved the study of oral behaviour, much of which could be termed stereotypies. In all of the housing systems the sows increased oral behaviour, such as sham-chewing and bar-biting, between the 1st and 4th gestation. The sows in stalls were involved in the most oral behaviour in both gestations. The group systems did not differ significantly from each other, although the numerical trend was for higher oral behaviours, particularly trough and sham chewing, in the small group (feeding stall) system.

Sows from the stall and ESF group were slaughtered after their 8th parity and their major muscles and leg bones tested [4]. Sows from stalls had a lower proportional muscle weight than those from the ESF group, and the breaking strength of their bones was also significantly lower. One of the 'freedoms' that favours groups over stalls is that of movement. The long term effects of the restriction of movement in stalls seems to be evident in the atrophy of muscles and weakening of bones. In a related study these same authors studied the ease (time) of lying by sows in stalls and in the ESF group [5]. Stall housed sows took longer to lie down. This may be related to the smaller muscles in stall sows, requiring greater effort to control the lying process, or there was also evidence that their movement was simply restricted in the stall. Among stall sows, the larger animals took longer to lie down than did smaller ones, but no relationship between sow size and time to lie down existed in the ESF sows.

In the four measures discussed so far, agonistic behaviour, oral behaviour, muscle and bone strength, and ease of lying, the differences between stalled and group-housed sows increased with parity and/or size. Physiological tests on these sows, designed to assess how well the adrenal gland could respond to stress, did not find any differences during the 4th gestation [3]. However, the other results would caution us to ensure that when we compare systems that we should include both young and old sows. Studies that last only one or two parities may not reflect the chronic effects of stall housing.

Stalls and Feeding Stalls

Frank Hurnik and Jim Morris at the University of Guelph designed a group housing system that used automated gating to provide small groups of sows access to individual feeding stalls every day. The sows were kept in groups of six on partially slatted floors with small amounts of wood shavings. Each day they were released from their pen, walked to a bank of feeding stalls, and then released from the stalls to walk past a boar on their return to their pen. The gestation stalls for the other treatment were spacious, measuring 2.1 x 0.75 m and on a solid concrete floor. Many of the measures made in a series of studies failed to detect any significant difference in the physiology or productivity of the pigs on the two treatments. However, at the conclusion of the studies

a summary was made of the life-time productivity and longevity of the sows in each system. The majority of animals assigned to the stall group were culled during the first two gestations (60%), while only 45% of the group-housed animals were culled during the same period. No sows lasted more than 6 parities in the stall system. The sows in stalls were culled more often for low productivity than were the group-housed animals. Various injuries resulted in similar levels of injury-based culling in both systems. Because of the earlier culling of stall-housed sows, their average parity was lower (2.6) than for group-housed (3.1). Productivity for individual parities did not differ between the two treatments, but lifetime productivity in terms of numbers born, weaned and total weaning weight were higher for the group-housed sows. It is interesting to note that longevity was better for the group housed sows, even though the stall housed animals were kept in quite spacious accommodation.

Size of Gestation Stalls

Although much research has been directed toward improving management within groups systems, there is also considerable variation in management within gestation stalls. One of the most critical issues, which I alluded to in the study of the Hurnik-Morris system [6], is the size of the stall. We have already seen that in a fixed length of stall, lying becomes more difficult with increasing length of the sow [5]. It has been suggested that stalls should be wide enough for sows to lie on their side without their udder extending into the adjacent stall. We looked at a factorial arrangement of sow size (basically gilt, parity 1-2, parity 3-4, and larger) and four stall widths (55, 60, 65, and 70 cm; 22, 24, 26, and 28 in, respectively). We found a very distinct break point in the ratio of body width ($BW^{0.33}$) to stall width, above which the sows would have their udder extending into the next stall. To meet the criteria of being able to lie with the udder within their own stall, sows would need stalls from 60-75 cm (24-30 in wide). Again, this study points out that comparisons of stall and group systems should cover several parities as the challenges of stalls are likely to be greater in later gestations.

Social Management

When keeping sows in groups there are a couple of basic management options. Should your sows be kept in static groups (no additions to the groups after the initial formation) or are dynamic groups (sows removed and added every few days or weeks)? Can sows be grouped shortly after breeding, or should you wait until after embryonic implantation (28 days)? We considered these two questions in a factorial study using an ESF system. In our dynamic management we removed sows and added new animals to the group every five weeks. This meant that sows were only exposed to one grouping event prior to implantation, whereas many programs re-group weekly. Under our conditions we found no difference between the static and dynamic programs. We did find a difference depending on when the sows were added to the group. If we kept the animals in stalls for 5-6 weeks after breeding, their farrowing rate was as high as that in sows kept in stalls throughout. If the sows were moved to the group on the Monday following breeding, farrowing rate tended to drop by about 4%. A similar benefit of waiting to re-group until after implantation was reported in an Australian study [7]. In both of these studies, sows that were post-implantation when placed in group housing fought less than those that were mixed during the week after breeding. At present we would caution producers to

stall their animals for 4-5 weeks after breeding before placing them in groups. However, some systems do group animals earlier and obtain high farrowing rates. We believe this is due to maintaining familiarity among sows each gestation period, or to regrouping within the first 2 days of breeding.

Group Housing and Lameness

I was involved in a study in Australia [7] in which we housed sows in stalls or in large groups (85 animals) in a bedded shed. The group sows were walked each day to a common bank of stalls for feeding. Sixteen groups were fed from the same set of stalls. We tested sows in both systems for lameness under a very specific protocol that examined how well they both walked and trotted. Sows that evidenced severe lameness were culled. The results were clear-cut. Sows in the group system had very low lameness scores and only about ½% were culled for lameness. Sows in stalls developed higher lameness scores through their pregnancy and about 4% were culled. Therefore, we were initially surprised to find that the University of Minnesota reported a higher culling rate for sows in ESF than for those in stalls, and that the major reason for culling was lameness [8]. However, the Minnesota authors point out that the high levels of lameness they encountered in the ESF system could be attributed to their use of fully slatted floors.

Grouping Immediately after Weaning

The research farm for Osborne Industries maintains both stall and ESF gestation systems. In a recent summary of their data conducted by Michigan State researchers, they reported quite high farrowing rates (89% in stall and 94% in ESF) and an earlier return to estrus in sows from the ESF system [9]. Their management included weaning all sows into a group and removing them for breeding. After their first breeding they were placed in stalls either for their entire gestation, or moved to ESF within 2-4 days of their second mating. The stalls were small (1.2 m^2), and the ESF system was on partially slatted floors. With the exception of their faster return to estrus and higher farrowing rates, ESF sows performed similar to the stall sows for all reproduction traits. There were apparently no differences in culling rates as data were recorded but not reported. In our study at the Prairie Swine Centre, the Australian study [7] and the study at Minnesota [8], we saw a reduction in farrowing rate if sows were placed into group housing before implantation. But in each of those studies, the sows were kept in stalls from weaning until several days after breeding. The Osborne practice of weaning into groups may be a viable alternative to delaying group formation until after implantation.

Summary

The studies that I have presented have used group housing systems that provided good control over individual feed intake with moderate to low feeding-associated aggression (ESF or feeding stalls). Under these conditions we saw very similar productivity between stall and group systems unless the group involved mixing sows before implantation had occurred. When grouping occurred after implantation, or in the one case of grouping at weaning, farrowing rates were just as high in group systems as in stalls. I would concur with the AVMA report [2] that productivity in stall and group systems is generally

similar. There were differences in longevity or culling rates, and as the AVMA report suggested, these seemed to be related to other management factors rather than stall vs group housing. In studies in which group housed animals were provided bedding [6,7], group housed sows remained in the herd longer or had lower culling rates for lameness. When fully slatted floors were used, culling rates for lameness were higher in group pens [8]. We need production and culling data on sows in different sized stalls, but the behaviour data would suggest that larger stalls would seem appropriate for high parity animals. We have little data within floor type for appropriate floor space allowances for group systems.

The AVMA [2] report suggested that the level of stockmanship is important within any system, and this may have contributed to differences among the studies mentioned. However, it is also apparent that specific management practices, such as time of re-grouping and floor type, which have little dependency on stockmanship, are also important in terms of the success of alternative sow housing systems.

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