Free space utilization of sows in free access stalls

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With announcements by the largest producer/packers in both the USA and Canada that they will transition all of their production facilities to group housing for sows over the next ten years, all North American producers are anticipating a change to group housing. This can be a challenging step for producers, and it is made more difficult by the lack of scientific information currently available on the implementation and design of alternative systems. Group housing systems can be complex to initiate and require greater input from stockmen, however when done correctly, can produce sows that are able to socially interact with one another and have the freedom to move. Sows currently housed in gestation stalls have almost no opportunity to exercise and perform natural behaviours, leading to a possible decline in well-being. It has previously been suggested that exercise is required to maintain bone composition and strength, and when exercise is insufficient, calcium will be mobilized from the bone itself (Lanyon, 1984 and 1987). Exercise is important to allow the development of bone and muscle to their maximum potential. Decreased muscular strength (which is commonly observed in confined sows) can contribute towards difficulty in lying and standing, and higher susceptibility to lameness due to increased slipping. Lack of exercise in confined housing has also been shown to cause bone weakness in other species. For example, confined laying hens have significantly weaker humeri and tibiae than birds housed in non restrictive environments (Knowles and Broom, 1990). One possible alternative to gestation crates are free access or walk-in/lock-in stalls.

This system provides sows with opportunities to interact as a group in a communal area, or remain alone in a free access stall. There is some concern regarding the degree to which sows use free space group areas, and how to avoid aggression, particularly when new sows are mixed into a group. This study investigates the implementation of walk-in/lock-in stalls for group housed sows. More specifically, the objectives of this study were to compare two different pen configurations by determining the proportion and type (size/parity) of sows that are using the free space areas of the walk-in/lock-in stalls, and also how sows utilize the free space areas.

Eight groups of ~25 sows were used in the study, and were housed in walk-in/lock-in stall gestation pens at the Prairie Swine Centre, Saskatoon. Groups were selected according to how many individuals were confirmed pregnant in a batch of animals within a 2 week breeding date window, therefore group size was not always the same. Each of the groups were exposed to one of two configurations of free space areas. The first is referred to as the 'I' pen as it consisted of an alley (10ft x 35ft) with slatted flooring running between two lanes of 16 stalls on each side. Any additional stalls, surplus to the group number, were locked off for the purpose of the trial. The second pen configuration is referred to as the 'T' pen as it consisted of an identical alley with an additional solid floor loafing area at one end (12ft x 23ft). Sows were weighed when moved from their breeding stall to the gestation pen, and individually marked with livestock paint.

Photographs were taken from mounted cameras at 2 minute intervals over a 24hr period, once a week, for 11 weeks throughout gestation.

Looking down onto the 'I' pen

Pigs using the 'T' pen free space area

Two cameras were set up in the 'I' pen, one at each end of the pen. Four cameras were used in the 'T' pen in order to also observe the free space area. The pens were divided into 3 areas (I pen) and 9 areas (T pen) (see Fig. 1). The individual sow and location was recorded numerically by a trained observer. Measurements recorded from the photographs include the percentage of time spent out of the stall over 24hrs, and also the

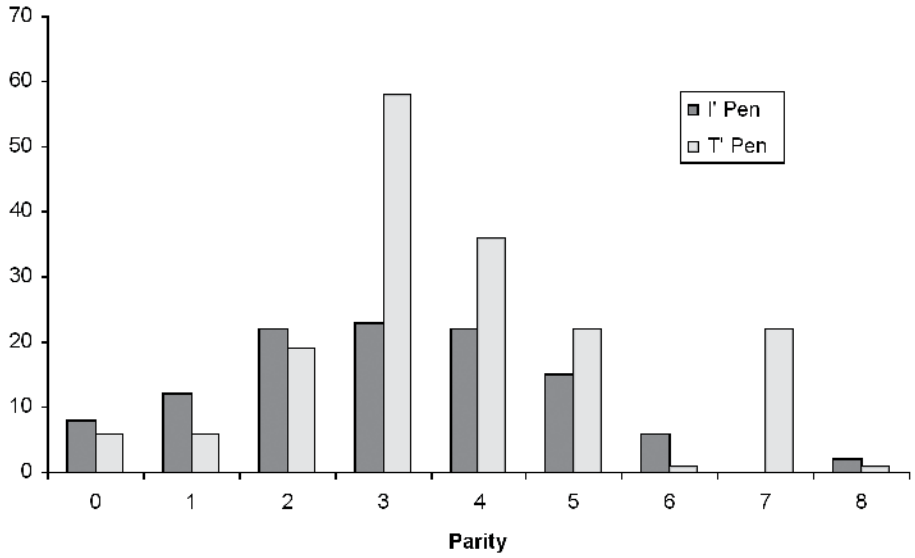

Figure 2. Average total time that sows of varying parities spend in the free access areas.

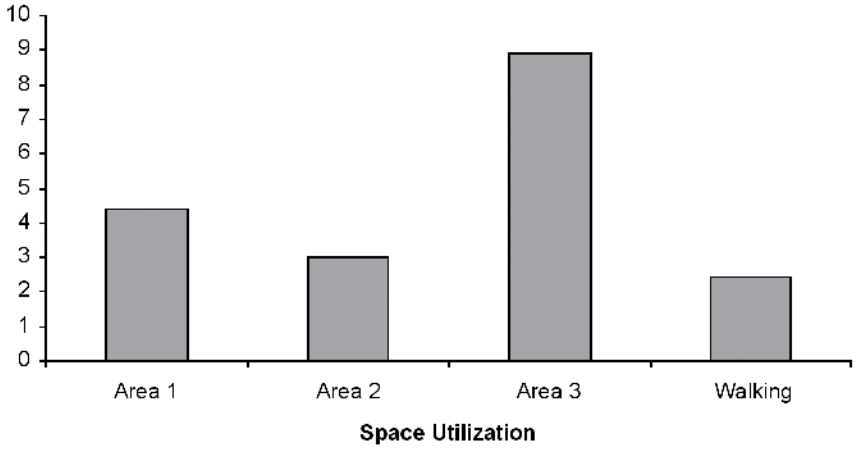

Figure 3. Percentage of time that sows spend in each location during utilization of the free space areas, I-pen data.

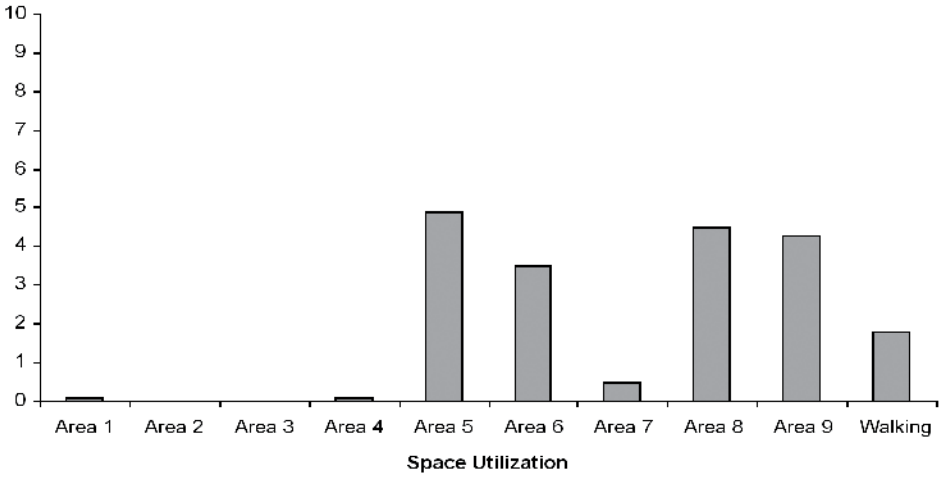

Figure 4. Percentage of time that sows spend in each location during utilization of the free space areas, T-pen data.

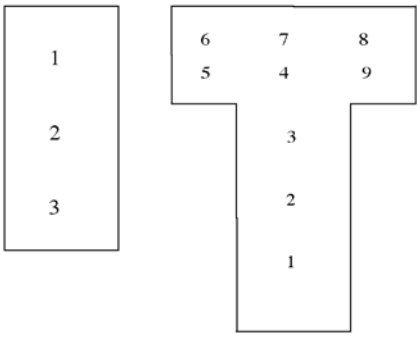

Figure 1. Location of free space areas used for space utilization analysis.

location and position of sows in the free space areas.

The majority of sows did use the free space areas (> 95% of sows) although not on a regular basis or for extended periods of time. The average usage for the 'I' and 'T' pens were both relatively low, however, the sows housed in the 'T' pens used the free space area significantly more than the sows housed in the 'I' pens ($P<0.001$). More than half the animals in the study spent < 5% of their time in the free space area, however the average usage was ~18% (with considerable individual variation). Heavier sows appeared to use the free space area significantly more than lighter sows ($P<0.0001$), and older (higher parity) sows also used the free space significantly more ($P<0.001$) (Fig. 2). Figures 3 and 4 illustrate the preferred lying areas of the sows. In the 'I' pens, the far end of the pens was the most preferred place to lie, with the highest recorded usage in Area 3 with 8.9% of the average total usage. Similarly, with the 'T' pens, the most preferred place to lie was also in the corners (Areas 5, 6, 8 and 9).

Although many sows did use the free space, it was at a much lower level than expected. This could be due to several possibilities, such as lower ranking animals feeling threatened by higher ranking sows, or larger sows utilizing the free space due to crowding in the stalls. It has been suggested that due to the rigorous selection for improved meat production, the body shape of modern domestic pigs has been changed (Whittemore, 1994). Selection has resulted in larger pigs which can have difficulty lying and standing, and may not fit comfortably into conventional stalls (24 inches wide).

The areas where sows have shown a preference to lie down all have more walls than the other available areas, which can act as support. This finding is in agreement with previous studies (mostly in the farrowing environment) where sows also show preference to use support

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"...compared to a grow-finish room with conventional forced-air convection heater, the room with infrared radiant heating system has consumed more gas but used less electrical energy ..."

showed that temperature variation was slightly higher in the second trial; this could be due to the colder ambient temperature since the average ambient temperature during the trial was 19.2 °C colder than during the first trial. Additionally, the setpoint temperatures for both rooms during the first 3 weeks of the test period was 23.7, 22 and 20 °C for the first, second and third week, respectively. The observed range of deviation above and below the setpoint temperature in all the locations in the Treatment room were 0.9 and 1.8 °C respectively, while the corresponding values in the Control room were 0.4 and 1.3 °C, respectively.

The average relative humidity readings recorded in the middle and near the exhaust fan in the forced-air heater room (59%) was slightly higher than those in the radiant heater room (57%). With regard to ventilation, average rates observed in the Control and Treatment rooms were 3269.7 and 3125.0 L/s, respectively during the first trial and 836.7 and 644.8 L/s, respectively in the second trial.

Over the course of the trials, hydrogen sulphide (H_2S) and carbon monoxide (CO) concentrations in both rooms were usually at levels barely detectable by the sensors with average concentrations of less than 1 ppm for either gas. However, during pit pulling events, concentrations of H_2S were observed to spike to considerably high levels with peak concentration of 91 and 97 ppm in the Control and Treatment rooms, respectively. Ammonia and carbon dioxide levels were relatively similar in both rooms with average concentrations below 10 and 2000 ppm, respectively.

Pig performance

The average daily gain (ADG), average daily feed intake (ADFI), and mortality rate were monitored during the two trials to evaluate the effect on hog performance. Both ADG and ADFI were found to be relatively similar in both Control and Treatment rooms. Average ADG values from the two trials were 0.95 and 0.94 kg/pig-day, while ADFI values were 2.64 and 2.55 kg/pig-day for the Control and Treatment rooms, respectively. Feed intake of pigs in the Control room was slightly higher than in the Treatment room, hence resulting to a slightly faster growth rate. During the first trial, average mortality rates of 1.8% and 4.0% were recorded in the Control and Treatment rooms, respectively, and zero mortality was recorded in both rooms during the second trial. Based on observations during daily animal health checks, mortalities in both rooms were health related, such as incidence of lameness and infections, and were unlikely to be related to heater performance.

The Bottom Line

Observations from the two completed trials so far indicated that compared to a grow-finish room with conventional forced-air convection heater, the room with infrared radiant heating system has consumed more gas but used less electrical energy, had a more uniform temperature distribution within the room, and had no adverse impact on the growth performance of the pigs. These observations will need to be verified after all trials are completed and appropriate statistical tests are conducted.

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when lying down. Marchant et al., (2001) reported that 89% of lying down events were carried out using either a sloping wall, or a wall fitted with a piglet protection rail.

With the transition towards group sow housing it is important that scientific research is used to design the optimum housing system which can facilitate social interactions and minimize aggression and competition. Future research resulting from this study will focus on methods for encouraging the sows to utilize the free space areas. This will include improving the comfort of the free space area with rubber mats, providing environmental enrichment, or possibly allowing sows access to the free area in different social groups (alternate groups) i.e. gilts and sows.

The Bottom Line

Group housing of sows is recognised as an alternative system for improving animal comfort and well-being however, we found that not all sows used the free space areas on a regular basis, or for extended periods of time. It is apparent that the older, heavier sows are utilising the space the most, therefore further research in this area will involve reducing social stress perceived by younger animals, and making the free space area more comfortable.

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