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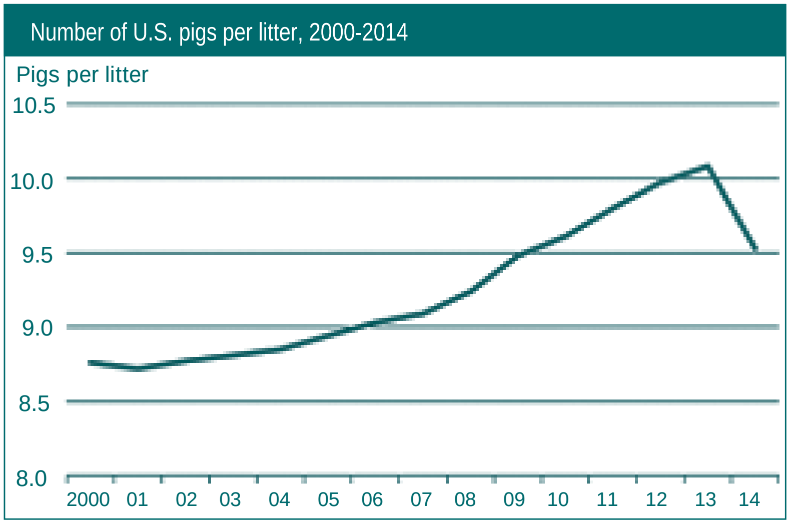
Protecting What You Have



Note: December-February pig creep
Source: USDA, Economic Research Service using USDA National Agricultural Statistics Service Data

Lee Whittington,
BSc(Agr), MBA, PAg
President/CEO,

The reminders of the spread of PEDv across Manitoba the past five months remind us just how fragile our systems can be to external challenges. Current market prices and forward contracts have given us a well needed breather as an industry to rebuild/refurbish our farms and fix balance sheets. Is that current financial success holding us back?

What I mean - Are we taking threats seriously enough to actually change practices to protect our farms? This article is primarily health focused because we have had the opportunity to travel to many farms, conferences and open houses the past year and there is a disturbing complacency toward health threats emerging in our attitudes and practices in spite of the real threat PEDv represents. If you are reading this in southern Manitoba you are probably thinking that health is all we have thought about for months and yes we have changed and reviewed practices and everyone is on 'high alert'. My concern is that outside of Manitoba we are not taking the same heightened awareness.

Two specific incidents come to mind. A packing plant tour is an excellent way to stay informed of how our product is transformed into food, this is particularly important for the students and staff at Prairie Swine Centre to help understand the larger industry. In 2014, several months after PEDv began wreaking havoc in the US, I was on a similar tour and everyone arrived with cleaned vehicles and were putting on plastic boot covers before they

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Publication # 40010021

Identification, treatment and prevention of shoulder lesions in sows

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Shoulder lesions are most commonly observed in sows during the weeks following farrowing[1]. Long periods of lying combined with poor body condition can increase the likelihood of sows developing shoulder sores. The prevalence of shoulder lesions varies greatly depending on farm and sow factors, with anywhere from 10 to 50% of sows being affected. Shoulder lesions, also referred to as shoulder sores or ulcers, typically appear as a circular sore on the upper shoulder.

In sows, shoulder lesions appear over the scapula, where the amount of soft tissue between the skin and bone is insufficient to distribute external pressure. Lying laterally (such as during nursing bouts) puts pressure on this area, and prolonged lying can restrict blood flow and result in localized tissue damage[1]. Shoulder lesions in sows are comparable with pressure ulcers in humans, also known as bed sores. Once they have developed they are difficult to treat, and will often return during the next lactation[1]. In practical terms this means sows are at their highest risk for developing lesions in the weeks after farrowing as they can spend over 90% of their time lying during this period.

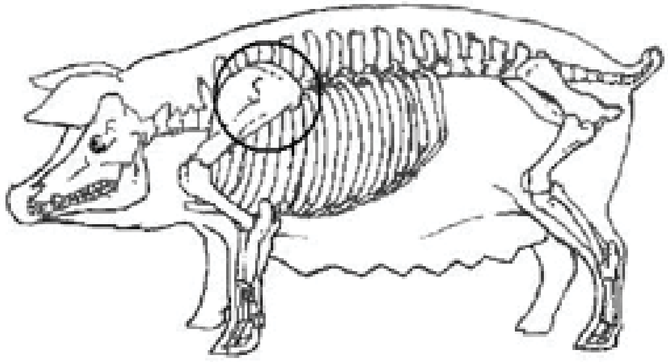

Figure 1. The sow's bone structure and typical location of shoulder lesions, where the scapula has minimal tissue coverage. Drawing J. Brown

The first indication of a shoulder lesion forming is reddening of the skin. The skin may become damp and flies can be attracted to the area. If the problem goes untreated, the sore can quickly progress to an open ulcer, and in extreme cases, the underlying bone may be exposed[1]. The occurrence and severity of shoulder lesions varies greatly from farm-to-farm, reflecting the multifactorial nature of this problem.

Risk Factors and Causes:

Barn and sow management: Sow body condition at farrowing is widely recognized as a key risk factor for the development of shoulder lesions. Sows scoring <3 on a 5 point scale are at greatest risk due to not having enough fat coverage over the shoulder, resulting in greater pressure when lying laterally[2]. It is generally believed that persistent compression of the blood vessels in the skin around the tuber of the scapular spine results in insufficient blood circulation, ischemia, necrosis, and subsequent ulceration. Maintaining sows in good body condition is therefore one of the most effective tools for reducing the prevalence of shoulder lesions[1].

The barn environment can also influence lesion formation. In farrowing pens, some floor types can contribute to the development of shoulder lesions. Depending on their design, slatted floors may cause problems as they provide less support and can cause more pressure to be placed on the shoulder compared to solid floors2. Higher temperatures can also influence lesion formation as sows may spend more time lying in hot weather, and high moisture levels (eg. drip cooling) can soften skin and may also result in slippery floors with sows being less willing to relieve pressure by standing or changing posture.

The identified risk factors also suggest that the trend for increasing productivity, in particular feeding larger litters and increasing weaning age, may result in an increased risk of developing shoulder ulcers. It is widely acknowledged that some sows may have a history of shoulder sores and should be given extra attention (e.g. provided with rubber floor mats in farrowing). If a sow has had a shoulder sore in her previous lactation, the chances of her developing sores in the following gestation is greatly increased[3].

Sows may also be reluctant to stand or change position in farrowing (thus not relieving pressure from the shoulder area) due to locomotive problems[4]. Looking at shoulder lesions in cull sows, researchers reported that open lesions were positively associated with rear foot abcesses[5].

Thus, fast recognition and treatment of lameness issues can also help to prevent the development of shoulder lesions.

Genetics: Several studies have found that shoulder lesions are a heritable trait. Breed effects have been found, showing higher prevalence in Landrace and Duroc sows compared to Yorkshires[2]. The heritability of shoulder lesions in (Swedish) Yorkshire sows was estimated at 0.13. With another study reporting heritability of the incidence of lesions (h^2= 0.18) and the size of lesions (h^2= 0.09) in Landrace x Yorkshire crossbred sows[6].

The estimated heritability of shoulder ulcers and the genetic correlations between shoulder ulcers, mean piglet weight and sow body condition were measured in Landrace sows. The estimated heritability of shoulder ulcers was 0.25, and a genetic correlation between shoulder ulcers and mean piglet weight was also found. The correlation was low, but positive and therefore unfavourable (0.23) as it indicates that the sows' ability to raise heavy piglets increases her risk of shoulder ulcers[7].

As shoulder ulcers are a heritable trait it should therefore be possible to identify genetic associations and reduce their prevalence by using this as a selection trait in breeding programs.

Consequences and treatment:

Shoulder lesions are believed to cause varying degrees of pain at different stages of severity[1]. They also provide an entry way for pathogens which can cause infection. Presently, no pain relief is typically given for the treatment of the lesions, however, based on the involved tissue structures and data from human pressure sore patients it is likely that their presence is a painful condition.

As with many problems, the prevention of shoulder sores is much more effective than treatment. However, due to the many factors that contribute to this problem it may be hard to eliminate them completely. A standard on-farm protocol for identifying and treating shoulder lesions should be established in conjunction with your veterinarian. Key points in any treatment plan include:

> "Maintaining sows in good body condition is one of the most effective tools for reducing the prevalence of shoulder lesions."

1. Hygiene: When lesions appear, they should be cleaned with soap solution, rinsed thoroughly and an antibiotic ointment or spray applied.
2. Monitoring: Affected sows should be monitored daily. All sows should be checked as they enter or exit the farrowing room in order to record and monitor the prevalence of shoulder lesions. Body condition and any signs lameness can also be monitored at this time and can provide a useful benchmark of herd health over time.
3. Treatment: Sows with established shoulder ulcers should be provided with a stall mat or moved to a pen with softer flooring. Deep straw bedding provides the correct properties for improving comfort, including increased distribution of pressure for lying sows. However, this may not be feasible in many production facilities, due to the use of liquid manure disposal systems or increased labour and production costs[8].

Research on different treatment options has focused primarily on the use of rubber floor mats. Sows provided with a mat had significantly decreased lesion healing time compared to sows housed in a conventional farrowing crate, or those provided with solid stainless steel plates under their shoulder region. Sows were also much more likely to choose to lie on flooring with a mat than without[2].

Another study compared the effectiveness of a combination of rubber mats and zinc ointment (25% zinc oxide) with a local antibiotic treatment

(Identification, treatment ... cont'd on page 9)

Using creep feeding as a strategy to improve post weaning feed intake and piglet growth

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Weaned piglets are subjected to a number of nutritional, social and environmental stressors. They are separated from the sow, moved to a new environment, mixed with non-littermates and expected to begin consumption of a novel diet (transitioning from sow's milk to solid feed). It is difficult to determine how much each stressor contributes to the growth lag often observed immediately post-weaning. However, post-weaning anorexia, coupled with the immature digestive and immune systems of the newly weaned piglet increases disease susceptibility and mortality.

Creep-feeding, the practice of providing highly palatable and easily digestible feed to nursing piglets to supplement sow's milk, is a strategy intended to alleviate problems at weaning. In theory, creep feeding should result in heavier piglets at weaning, and since the piglets have been accustomed to solid feed, the post-weaning growth lag should be lessened. However, research results on creep feeding are inconclusive and confounded by several factors including litter size and individual variation in creep feed consumption, between and within litters. Therefore, an experiment was designed to determine which piglets consume creep feed in the farrowing room and whether the presence of creep feed improves feed intake and body weight gain post-weaning. A second objective was to determine if piglets consuming creep feed in the farrowing room have improved post-weaning feed intake. Answers to these questions will provide pork producers with practical information, which could assist with the weaning transition. This, in turn, will decrease pig losses and allow a decreased use of antibiotics while producing piglets, which are heavier at nursery exit.

Figure 1. Piglets in two farrowing pens at creep feeders.

Study design

This experiment was designed to measure, in a commercial-like setting, which piglets in the farrowing room consume creep feed and whether this consumption provided benefits into the nursery, including consumption of the phase 1 starter diet. Nine farrowing groups, totaling 115 sows were randomly assigned to one of 2 treatments (creep or no creep) at farrowing. Cross-fostering of piglets (to equalize litter sizes) was conducted within the first 24 hours after birth. Piglets were weighed at birth and on day 21 when creep feed (commercial stage 1 starter) was provided for those piglets on that treatment. The creep feed was supplied in a commercial feeder, similar to that identified by others (Sulabo et al. 2010) as the feeder which maximized creep feed intake and minimized wastage (Figure 1).

Piglets were weaned as per normal production practice on day 26 post farrowing. Although different litters were mixed at weaning, the treatment groups (creep or no creep) were maintained in the nursery. Whether a piglet had been designated an "eater" or a "non-eater" (described below) did not affect the nursery designation.

The creep feed and the nursery diets were marked with brilliant blue dye and ferric oxide, respectively. The dye was removed from the creep feed 2 days prior to weaning to allow the marker time to exit the body.

Anal swabs were taken from each piglet in the creep fed groups 2 days prior to weaning and from all piglets on day 2 in the nursery to estimate intake of creep feed in the farrowing room and the nursery diet during the first 24 hours, respectively. This allowed us to categorize creep fed piglets into "eaters" and "non-eaters", and to determine if this correlated to feed intake in the nursery in the first 24 hours post-weaning.

Table 1. Effect of creep feed provision from d 21 to d 26 in the farrowing room on nursery performance

	Treatment			
	Creep	No-creep	SEM	Pvalue
Body weight				
Weaning	7.66	7.75	0.12	NS
Nursery exit (d 29)	20.62	20.29	0.34	NS
Average daily gain, nursery				
Weaning to d 3	0.14	0.14	0.02	NS
d 4 to 7	0.14	0.10	0.02	< 0.01
Wean to exit (d 29)	0.45	0.43	0.01	0.05
Average daily feed intake, nursery				
d 0 to 3	0.13	0.12	0.01	NS
d 4 to 7	0.23	0.20	0.01	0.06
Wean to exit (d 29)	0.58	0.56	0.02	NS

*SEM, average standard error of the mean

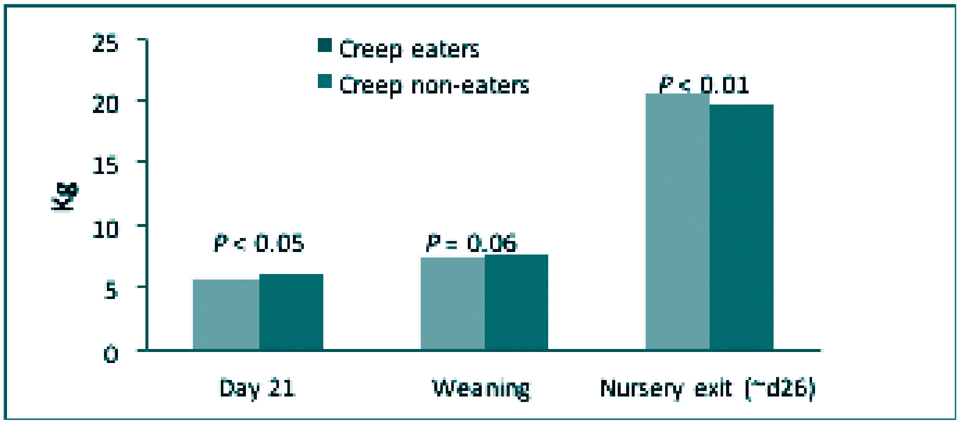

Figure 2. Body weights of piglets offered creep feed in the farrowing room from day 21 to weaning, classified as either "eaters" or "non-eaters" (piglet is the experimental unit).

Results

Effect of creep feed provision on pig performance at weaning and nursery exit

Offering creep feed in the farrowing room for 1 week prior to weaning did not improve overall piglet weaning weight or growth rate from day 21 to weaning. Also, nursery exit weights were similar regardless of creep feed provision (Table 1). However, ADG and ADFI during the nursery phase increased (or tended to increase) in pigs that had been provided creep feed.

Approximately 45 % of piglets had apparently consumed some of the phase 1 diet in the first 24 h post-weaning, regardless of creep feed provision (Table 2, on page 7). This was not affected by birth or weaning weight. It is widely believed that the initial 24 h post-weaning is crucial for piglets' later development. Indeed, piglets identified as nursery "eaters" had greater ADG throughout the nursery period, resulting in slightly greater nursery exit weights.

Finally, of the 37% of piglets designated as creep "eaters", 54% of these were also "eaters" of the phase 1 diet (ee), whereas 44% of the piglets designated as creep "non-eaters" had evidence of phase 1 diet consumption within the first 24 h post weaning (ne; Table 3, on page 7). Therefore, 10% more piglets with evidence of creep feed consumption, consumed phase 1 diet during the initial hours in the nursery. This percentage is less than we were anticipating. Piglets who were nn (no evidence of either creep feed of phase I diet intake) were the lightest at nursery exit. Piglets with evidence of creep feed and phase 1 diet consumption had the highest growth rate from weaning to d3 post weaning and throughout the nursery period.

(Using creep feeding ... cont'd on page 7)

(Protecting What You Have... cont'd from page 1)

stepped out of their vehicle – in 2017 it was back to business as usual, farm vehicles in various states of cleanliness and not one pair of plastic boot covers to be seen. A second example was at a swine industry tradeshow – transport units parked in the lot beside the passenger vehicles. It was not difficult to tell these trailers were swept out but not washed nor baked.

These two examples speak to my concern that we just aren't using all the knowledge available to us to protect our farms.

At the same time I see headlines that tell us health challenges are all around us. Internationally Uruguay has identified PRRS for the first time in widely separated areas. The country undergoes regular testing so what happened? Closer to home, a PRRS virus variant previously associated with Minnesota is now in western Canada. Homegrown problems with Strep Suis seem to be on the rise. The Canada-West Swine Health Intelligence Network noted laboratories reporting an increase in positive cultures. Our own experience is that hot temperatures and extra movement and handling triggered a couple weeks of sudden losses that are not typical for this herd.

Our industry has enjoyed phenomenal growth in productivity and generally improving health status for several years. We know all too well that we cannot rely on continued access to antibiotics, and now additional scrutiny on zinc and previously copper in the EU promises to spill over and take yet one more tool from the troubleshooting toolbox. One editorial suggested 2.50 Euro per pig in reduced earning if Zinc Oxide became unavailable. These factors are all the more reason to keep the biosecurity high.

The following is sourced from the Canada-West Swine Health Intelligence Network Report July 31 regarding heightened biosecurity measures that should be considered as you review your biosecurity plan.

- Managing Transport –wash and bake trucks
- Managing any supplies, including feed ingredients and breeding stock coming from infected areas
- Compost deadstock (to reduce rendering traffic to your farm)
- Follow strict contractor protocols
- Participate in the environmental testing programs

Our Centre is undergoing another internal biosecurity audit. We do this about every 18 months to 2 years, rotating between internal and external audits. Every time we find something. This is time well spent to protect what we have.

Lee

FEEDER DESIGN

The minimum width of a feeding space is based on the shoulder width of the largest pig in the pen, plus 10 % to accommodate variation in body shape. The formula used to calculate the width of a feeding space is:

Minimum feeder space width

= maximum shoulder width x 1.10 **OR** = (6.1 x maximum body weight (kg)$^{0.333}$) x 1.10

Recommended Width of Eating Space

Weight of Largest Pig in Pen		Feeder Width	
kg	lbs	cm	in
55	121	25.5	10.2
70	154	27.7	11.1
100	220	31.1	12.4
110	242	32.2	12.9
120	264	33.1	13.2
130	287	33.9	13.4
140	309	34.8	13.9
150	331	35.6	14.0

Feeders are most crowded when growing pigs reach a point that only one pig can eat from a feeder space at the same time (typically 25 kg), at which point they spend 80-110 minutes/day eating, depending on the feed and feeder type.

Source:
National Farm Animal Council, Code of Practice for the Care and Handling of Pigs, 2014.

Recommended Depth of Eating Space

Weight of Largest Pig in Pen		Feeder Width	
kg	lbs	cm	in
Finisher Only			
60 - 110	132 - 220	30 - 35	11.8 - 13.8
Grow/Finish			
25 - 120	55 - 264	25 - 30	9.8 - 11.8
Wean to Finish			
8 - 120	18 - 264	25 - 30	9.8 - 11.8

Depth refers to the distance from the lip of the feeder to the point of feed access.

Source:
National Farm Animal Council, Code of Practice for the Care and Handling of Pigs, 2014.

This project 'From Innovation to Adoption: On-Farm Demonstration of Swine Research' is funded by Swine Innovation Porc within the Swine Cluster 2: Driving Results Through Innovation research program. Funding is provided by Agriculture and Agri-Food Canada through the AgriInnovation Program, provincial producer organizations and industry partners.

(Using creep feeding ...cont'd from page 5)

Table 2. The effect of apparent phase 1 diet consumption ("nursery eater") during the initial 24 hours post weaning on the nursery performance of piglets.

	Nursery eater	Nursery non-eater	SEM	P value
Number of Pigs	436	527		
%	45	55		
Body weight				
Birth	1.48	1.47	0.02	NS
d 21	5.89	5.99	0.09	NS
Weaning	7.60	7.76	0.11	NS
Nursery weight				
d 3	8.10	8.11	0.10	NS
d 7	8.62	8.55	0.11	NS
d 14	11.09	10.81	0.15	0.04
Exit (d 29)	20.7	20.1	0.34	<0.01
Average daily gain,				
d 21 to wean	0.24	0.25	0.01	0.04
Nursery				
Wean to d 3	0.16	0.12	0.02	<0.01
d 4 to 7	0.14	0.11	0.01	<0.01
d 8 to d 14	0.35	0.32	0.01	<0.01
Wean to nursery exit (d 29)	0.45	0.43	0.01	<0.01

SEM, standard error of the mean

Conclusion

Overall, the provision of creep feed for 5 days prior to weaning had no effect on weaning weights or growth rate from day 21 to weaning, however, modest effects were observed on piglet growth rate in the nursery. Interestingly, within the creep treatment, it was the lighter piglets which took advantage of the creep feed, and this subset of piglets showed an improved growth rate. Therefore, the provision of creep feed in the farrowing room provides benefits to piglets that show evidence of consumption and it is the lighter-weight piglets which benefit most from the provision of creep feed, and thus within litter variability may be reduced.

Acknowledgements

This project was supported by Government of Saskatchewan and Agriculture Development Fund (ADF). Program funding for Prairie Swine Centre from Sask Pork, The Manitoba Pork Council, Alberta Pork and Ontario Pork is gratefully acknowledge

Table 3. Performance of piglets categorized as "eaters" or "non-eaters" in the farrowing room and/or the nursery (~24 hours post weaning)

	Eater classification					
	ee	en	ne	nn		
Farrowing	Eater	Eater	Non	Non		
Nursery	Eater	Non	Eater	Non	SEM	P value
n, (piglets)	94	79	129	163		
% of total	20	17	28	35		
Weight						
Birth	1.52	1.49	1.47	1.48	0.05	NS
d21	5.54b	5.76ab	6.01a	5.89a	0.18	0.06
Wean	7.33b	7.57ab	7.80a	7.66ab	0.20	0.05
d3 nursery	7.97	7.97	8.25	7.98	0.21	NS
Nursery exit (d 29)	21.22a	20.91a	20.87a	19.80b	0.54	<0.01
Average daily gain, nursery						
d1 to wean	0.26	0.26	0.26	0.25	0.01	NS
Wean to d3	0.21a	0.13bc	0.15b	0.11c	0.02	<0.001
d4 to 7	0.15ab	0.18a	0.14bc	0.12c	0.02	<0.001
d8 to 14	0.38a	0.35a	0.36a	0.31b	0.02	<0.001
d14 to exit (d 29)	0.66a	0.65a	0.64a	0.61b	0.03	<0.01
Wean to exit (d29)	0.48a	0.46ab	0.45b	0.42c	0.01	<0.001

SEM, standard error of the mean; Means within the same row with different superscripts differ significantly ($p < 0.05$).

Ventilating converted sow rooms

Bernardo Predicala, Ph.D.

Ken Engele, BSA

Ventilation affects many aspects of the of the environment as well as barn operating costs.

Retaining the existing ventilation system in converted sow facilities will lead to over-ventilation during winter months, because existing minimum ventilation fans are designed for higher animal densities. This results in using extra heating fuel, and potentially causing chilling of the animals affecting performance. If ventilation is continued at the pre-conversion levels, the building would be ventilated by 33% higher than required which can cause a rise in heating energy consumption of 75%. During summer, the impacts are less pronounced but over-ventilation will use extra electricity which translates to higher costs.

In addition, the transitioning of the ventilation system design from stalls to group housing involves not simply reducing the ventilation rate but also requires careful re-configuration to ensure proper air distribution throughout the room to eliminate dead spots (unventilated areas) and unwanted drafts. Air exchange is critical to providing a healthy environment that fosters efficient pig growth by reducing humidity and gases like ammonia and carbon dioxide. Since under-ventilation can create an unhealthy environment and over-ventilation wastes energy, finding the right balance is key to a healthy environment for both animals and workers as well as to energy savings and efficiency. This balance can only be achieved by careful re-design of the existing ventilation system of a converted gestation barn.

In this project, numerical computer simulation technique which utilized computational fluid dynamics (CFD) principles to numerically simulate fluid flow, heat and mass transfer, and mechanical movement, was used as a tool to examine various design configurations and determine the most effective design of the ventilation system for a converted group sow housing facility. Ventilation system design parameters investigated include: (1). Capacity and location of exhaust fans, and (2). size and location of air inlets. These two parameters were configured in such a way that the resulting ventilation system design followed the following principles: upward airflow, downward airflow, or horizontal flow ventilation.

Barn implementation of the most effective ventilation system design

Two group-housed gestation rooms were used: one room designated as the Treatment room was modified to incorporate the horizontal flow configuration, identified from the simulation work, while the second room's ventilation system was similar to those in pre-converted (stall) gestation

Figure 1. Photos of the control room with the existing (unmodified) ventilation system (A) and the treatment room with the air inlets on the opposite side (B) following the principle of a horizontal flow ventilation system. B – inset: wall air inlets installed in the treatment room.

barns (Control room). Eight replicates (4 winter, 4 summer) were carried out.

Figure 1 shows the ventilation design configuration of the two experimental rooms. In Treatment rooms, air inlets were located at one end of the room and exhaust fans at the opposite end allowing air to flow horizontally through the entire length of the room (Figure 1A). In Control rooms, inlets were located on the ceiling while the fans were on one of the external walls; this configuration represented a downward air flow direction which is typical in commercial sow barns (Figure 1B).

Conclusions

Results from the computer simulation work have confirmed the need to re-design the ventilation system of a newly-converted group sow housing facility. Among all the design configurations tested, horizontal flow ventilation system was the most effective in removing heat from the animal occupied zone (AOZ) in the room during both summer and winter seasons.

In-barn evaluation of the selected ventilation system design showed about 21% reduction in natural gas consumption during heating season and 14% reduction in electricity consumption in the room with the horizontal flow ventilation system.

The horizontal ventilation system design for group sow housing has provided better air quality and cleaner floors than the unmodified ventilation design.

Animal performance and productivity were not adversely nor beneficially impacted by having a horizontal flow ventilation system in a gestation room.

In terms of behavior and welfare, enrichment use was greater in the room with the horizontal ventilation design which implies that sow comfort was better in the Treatment room.

Acknowledgements

Financial support for this project has been provided by Agriculture Council of Saskatchewan Inc. through the Advancing Canadian Agriculture and Agri-Food Saskatchewan (ACAAFS) program, and the Saskatchewan Agriculture Development Fund. Strategic funding provided to the Prairie Swine Centre by the Saskatchewan Pork Development Board, Manitoba Pork Council, Alberta Pork, Ontario Pork, and the Saskatchewan Ministry of Agriculture is also acknowledged.

(Identification, treatment .... cont'd from page 3)

(chlortetracycline spray) on healing of shoulder ulcers in three sow herds. Sows were paired according to the grade of their ulcer and were randomly divided into two treatment groups: i) mats and zinc ointment, or ii) antibiotic spray.

The rubber mat and zinc treatment had a statistically significant effect for lean sows, the average shoulder ulcer size was smaller on day 14 (3.8cm^2 versus 9.5 cm^2) than when antibiotic spray was used[9].

Prevention of shoulder lesions:

Based on previous scientific studies, two methods were identified as most effective for reducing the prevalence and severity of shoulder lesions: 1. Ensuring good body condition when entering farrowing, and 2. Using rubber mats to reduce pressure on the shoulder region of the sow.

Monitoring and maintaining body condition prior to farrowing and throughout the first weeks of lactation is critical. Increasing movement in the most vulnerable sows could be a strategic management strategy to prevent the development of sores in at risk sows. Interrupting the lying bout by getting the sow up periodically will theoretically increase blood flow to the tissue and restore the oxygen supply[9]. It has also been found that the odds of a sow developing shoulder ulcers during lactation is three times higher in sows housed without rubber mats than in those with rubber mats extending to their hind limbs[10].

The true incidence of shoulder lesions is likely underestimated due to their multifactorial nature and lack of accuracy in reported reasons for culling. Because these lesions cause pain and contribute to the culling of sows, they raise concerns for animal wellbeing as well as representing a significant economic cost to producers. Future research should focus more on preventative management of sows, as this is a far more effective and useful approach, however robust strategies to deal with shoulder ulcers once they appear must also be developed, as the problem will persist until such time as an effective means of prevention can be implemented.

Take Home Message:

The prevalence of shoulder lesions in sows is associated with higher weaning weights, suggesting that higher producing sows are more susceptible to this condition. Thus, it is important to monitor sow body condition and adjust feeding levels as needed and to treat shoulder lesions promptly when they occur to promote the wellbeing and productivity of the herd.

However, both sow and farm factors influence the prevalence of shoulder lesions. Environmental factors which can play a role include the type and condition of flooring, temperature and humidity conditions, and to some extent, genetic selection. Regularly monitoring sows in farrowing and following up with rapid treatment of early signs of lesions (eg. use of mats) are useful steps in preventing these injuries from developing. Reducing the prevalence of sow shoulder lesions can save money and reduce losses to producers due to veterinary treatment, lost production, and the cost of replacement sows which currently represents a significant economic loss.

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Optimum space allowances for nursery pigs

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Space allowances given to pigs can affect the economic viability of farms and also the health and welfare of animals. While there has been significant body of research studying the effects of space allowances on grow-finish pigs, little information is available regarding the effects on nursery pigs.

Studies have shown that providing an optimal space allowance increases productivity by maximizing feed intake and the average daily gain of animals. However, optimum economic performance is influenced by high growth rates as well as by increasing the number of pigs per pen and overall barn throughput. The optimum for space allowance for maximum economic returns is lower than that for achieving maximum growth rate. As well as affecting ADG, providing space allowances below optimal recommendations can also negatively affect the welfare of the pig, with risk of immune suppression, increased disease susceptibility, restriction of normal behaviours and an increase in damaging behaviours. As a result, establishing optimal space allowance requirements requires consideration of economic, health and welfare factors.

When recommending space allowances for farm animals, researchers use an 'allometric' formula which uses the average body weight and a constant (k) to calculate the space allowance needed per animal. When this formula was used to estimate space allowances for grow-finish pigs, it was concluded that a k value of 0.0335 (equivalent to 0.7m2 of space for a 100 kg finisher pig) provided optimal space, and maximum ADG. When pigs were given more space, no increase in ADG was found, but when space allowance was reduced below this value ADG dropped, in proportion to the crowding.

The same space allowance (k value) has been proposed for nursery pigs, however, young pigs behave very differently from older animals and may have different space requirements. For example, nursery pigs perform more overlying behaviour, and thus may have a lower optimum space requirement than finisher pigs. With ongoing reductions in antibiotic use increasing concerns for animal welfare and getting the weaned pig off to a good start, finding appropriate space allowances based on animal behaviour, health and performance considerations will be the way forward.

This article presents some initial results from research done at the Prairie Swine Centre on space allowances for nursery pigs. The studies were carried out on a research farm and on two commercial farms. Measures included productivity (ADG), feed efficiency, behaviour and stress physiology, with the goal of identifying the critical cut-off at which crowding occurs and to address areas where uncertainty remains.

Methods

To compare effects on a research farm to those on a commercial site, the study was done in two phases; with controlled trials at the Prairie Swine Centre (Phase 1); and commercial trials at two farm sites (Phase 2). In phase 1, a total of 1,200 weaned pigs were studied for approximately 5 weeks. Piglets were given six different space allowances (k= 0.023, 0.0265, 0.0300, 0.0335, 0.0370, and 0.0390); pigs were weighed weekly, and pen size adjusted to maintain the targeted space allowance.

Group size is another important factor affecting social interaction among pigs. Some researchers have argued that larger groups require less space, due to the increased sharing of free space, while others have disputed this finding. In phase 1, pigs were housed in groups of 10 and 40 to study interactions between group size and space allowance.

Commercial trials (Phase 2) were done on two farms using the same six space allowance treatments used in phase 1 however, pens remained static in size. The number of pigs per pen was adjusted to target space allowance based on the nursery exit weight (25 kg)- ranging from 19 to 32.

Feed use was recorded and pigs were weighed at nursery entry, 3 and 5 weeks. Cameras were placed above each pen in weeks 1, 3 and 5, to record standing, sitting, lying, feeding and drinking behaviour. Lesions on pigs were recorded to evaluate aggression, and saliva samples were collected on the research farm at three time points to measure pigs' stress response.

> "Lower space allowances had a negative impact on average daily weight gain, especially between weeks 3 and 5."

Results and Discussion

On the research farm, space allowance had no effect on the average daily weight gain, feed intake or feed efficiency. However, at commercial sites lower space allowances showed reduced average daily gain, particularly from midpoint (day 21) to end of the trial (day 45).

The lack of space allowance effects on growth on the research farm compared to commercial sites was likely due to the high health status and added care provided on the research farm. Space allowances were adjusted weekly on the research farm to increase the impact of space allowance, but despite this no impact on growth was seen. In contrast, the commercial sites had a constant space allowance, giving pigs relatively more space during their first weeks in the nursery with crowding increasing gradually over time, but space allowance had a significant impact. Antibiotic reduction studies have also found fewer effects in the research herd, due to the reduced challenge in a controlled, high health environment.

Behaviour measures can be helpful in interpreting these production results, as pigs will adjust their behaviour to compensate for crowding before changes in growth are seen. For example, in finisher pigs housed in large groups, studies show that pigs will adjust their feeding behaviour to eat fewer meals per day, with longer feeding bouts because it requires more effort to access the feeder. In this study, more nursery pigs were observed sitting at lower space allowances, and on commercial farms there was a large increase in sitting in week 5, compared to weeks 1 and 3. Sitting has been suggested to be a 'cut off' strategy is pigs and an early indicator of stress. Pigs also did less lateral lying (lying on their side) at low space allowances, presumably due to crowding.

Feeding and drinking behaviour were both affected by space allowance and group size. As space allowance was reduced, the total time spent feeding dropped from 49 to 44 minutes per day and the average length of feeding bouts decreased from 2 to 1.9 minutes. However, the number of feeding bouts per 8 hour day increased from 23 to 25. Similarly for drinking behaviour, reducing the space allowance given to pigs resulted in less total time spent drinking, reduced the average drinking bout length and increased the number of bouts per day. However, when group size was increased, the total time spent drinking increased. One theory is that pigs in the larger group were more active and therefore drank more, however, this cannot be confirmed as water consumption was not recorded.

The behaviour of nursery pigs changed greatly during their time in the nursery. Sternal lying and overlying reduced as pigs grew, and sitting increased. Overlying behaviour showed the greatest change, and reduced by 50 percent after the first week. This observation refutes previous suggestions that nursery pigs require less space due to their propensity to overlie. However, this study shows that pigs' willingness to overlie is drastically reduced after first week in nursery, and is lowest at the end of the nursery period when space allowance is lowest.

Conclusions

In this preliminary analysis, lower space allowances (below k 0.0335) had a negative impact on average daily weight gain, especially between weeks 3 and 5 on commercial farm sites. Space allowance also affected the feeding and drinking behaviour and postures of pigs. Changes in behaviour can be used as an early indicator of potential impacts on productivity. Overlying behaviour reduced significantly soon after weaning, indicating that pigs are less willing to overlie at the end of nursery phase, when pigs are most crowded, so this behaviour cannot be used to justify reduced space allowances.

While further analysis is needed to draw firm conclusions from this study, the results indicate that pigs reared under commercial conditions were more susceptible to crowding stress than those managed under research farm conditions. Weaning and nursery are critical stages in pig production and are highly stressful. With increasing pressure to reduce antibiotic use, it will be even more important to consider space allowances in the nursery, and to ensure that pigs get a good start on life.

Personal Profiles

Rochelle Thiessen

Rochelle Thiessen is a MSc student at the University of Saskatchewan under the supervision of Dr. Daniel Columbus (Prairie Swine Centre Inc.) and Dr. Andrew Van Kessel (Department of Animal and Poultry Science). Her research focuses on examining the impact of dietary fibre and fermentable protein on the threonine requirements of grower pigs as well as its impacts on animal health/gut barrier function. Rochelle grew up in the small town of Hague, SK and obtained her BSc. Agriculture with a major in Animal Science from the University of Saskatchewan in April 2017. Rochelle had previously developed her passion for working in the livestock industry after working for Fast Genetics in Spiritwood, SK as a Swine Production Technician for the last 3 summers. She also received the P.A. Thacker Undergraduate Scholarship in Swine Production at the University of Saskatchewan in March of 2017. Rochelle recently began her MSc in May 2017 and is training to further her knowledge and research skills in swine nutrition and gut health/function.

Coming Events

Saskatchewan Pork Symposium
Saskatoon, SK.
November 15-16, 2017

Brandon Hog & Livestock Show
Brandon, MB.
December 14, 2017

Banff Pork Seminar
Banff, AB
January 9-11, 2018

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