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PRAIRIE SWINE CENTRE 25 YEARS

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Are Sows Motivated for Movement?

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The Canadian Code of Practice for the Care and Handling of Pigs requires that as of July 1, 2024, all mated gilts and sows must be housed in groups, or individual pens. Mated gilts and sows may also be housed in existing stall barns if they are provided with the opportunity to turn around or exercise periodically, or other means that allow a greater freedom of movement. What constitutes 'greater freedom of movement' and the suitable options to meet this Code requirement must be clarified, by July 2019, as informed by scientific evidence, however at present there is minimal scientific evidence to address this question. The objective of study is to provide scientific information to be used as a basis for this recommendation.

A total of 24 animals (12 gilts, 12 sows) were studied for their motivation to exit the gestation stall and gain access to the alleyway between stalls for a three minute period. An operant panel was constructed that contained two identical buttons (Figure 1) that were programmed to count the number of presses made to each button. One button is designated as the active button (AB), as push counts to this button can result in a reward for the sow. The other is designated as the dummy button (DB), acting as a control measure;press counts made to this button have no effect and do not contribute to the sow obtaining a reward.

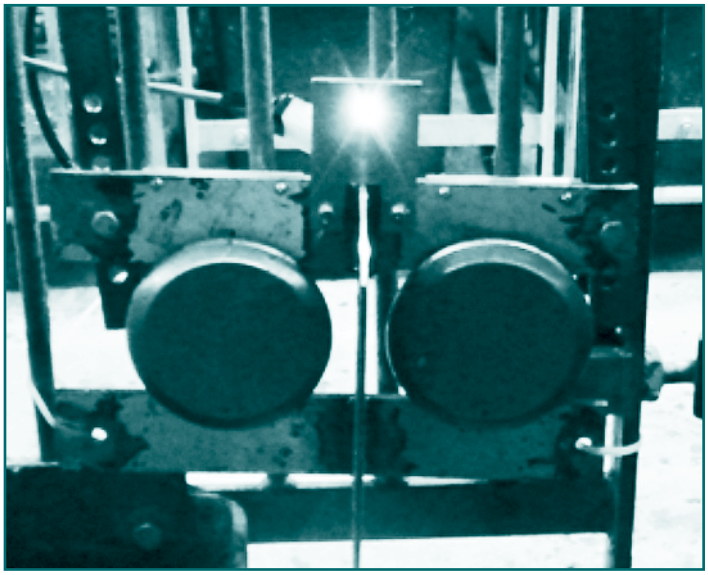

Figure 1: The operant panel containing two identical buttons, a central divider, and a light to indicate when the panel is active. Image shows the operant panel hung inside a stall gate.

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Inside This Edition

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What's Happening at Prairie Swine Centre?

Production Perspective

Tatjana Ometlic
Assistant Manager, Operations

Pork producers are always looking for ways to increase efficiency in their operations. New technologies that provide the potential opportunity to reduce cost and enhance labour efficiency are highly valued by producers. One of the latest technologies (automations) we have implemented at the Centre was the installation of a Gestal Quattro system in four farrowing rooms this past May (2018). The Quattro system is the fifth generation of the Jyga Technologies lactation feeding system, with its main advantage being the ability to optimize feed intake and management in lactating sows while simultaneously managing the environment of the litter.

Throughout May it took a week of hard work and long hours for the Jyga crew and the maintenance team at the Centre (Sam Gelowitz) to complete the installation in all four rooms which included 64 feeders. Managing to work in and around sows while completing the installation was made a lot easier as a specially designed gate was constructed to block sows while working around the feeders. There is a definite learning curve in utilizing the system – as it took some time to fully understand how the system works. In addition figuring out all the "bugs" took some time and help from the Jyga's technical support to get through all the glitches. In total we spent a couple of months in working through all the troubleshooting to the point where the system functioning effectively on a daily basis. I'm sure there will be more questions to arise as time goes by, but our production team, as well as sows, are starting to see the benefits associated with the system.

How does it Work?

Gestal Quattro stimulates sow feed intake, reduces feed waste and makes sow management easier. It has customizable heat curve and temperature probe. It will reduce electricity demands while improving litter performance. When the feed motor turns on to drop feed for the sow, the heat lamp is briefly shut off. Once the feed drop is complete, the heat lamp turns back on. This new feature of environmental control should have a positive impact on the litter performance. Sows can access feed on request according to their appetite. There are six feeding times within each feeding period in which fresh feed is provided whereby 1 kg of feed is available every 15 min at each feeding time up to 12 kg/day. At midnight, the system searches for all sows over 5 days post farrowing for feed consumption and a report is printed by 7:00am for production staff to access first thing in the morning. Lactation feeding times start at 10:30am, 1:30pm, 4:30pm, 7:30pm and 10:30pm. Light timers are installed on all farrowing rooms so sows can have more light access and better feed consumption during lactation time. Lights in the farrowing rooms are kept on from 6:00am to 8:00pm.

> "At Prairie Swine Centre we are always looking for ways to increase efficiency within the production system"

Production Perspective

It's only been a few months, but I think we can safely say that Gestal Quattro has a lot of benefits for the sows and production staff. At weaning, sows are coming out of farrowing rooms, better conditioned. Being able to easily detect the sow that missed feedings is a big benefit of the system. Sows are properly fed throughout lactation in a very continuous manner, (24 hour/day) while eliminating human factor in feed distribution during lactation. This system provides us with fast detection of sows with low or high feed intake. There has been a significant decrease in food wastage, eliminating some of the dry pit issue we had in the past. When in the barn next time, please stop by and we will be happy to show you some of the features Gestal Quattro offers!

(Are Sows Motivated...cont'd from pg.1)

Training and testing procedure

Sows were trained and tested in two phases, in one phase, the reward was the gate opening and the sow being allowed to roam the alley. In another phase, the reward was 0.2kg of feed. The order of training and testing for stall exit or extra feed was balanced, with half of the sows trained to exit first, and half trained to receive extra feed first. When training and testing animals to exit the stall, sows were rewarded for pressing the active button (Figure 2) with three minutes of time to freely move around within the alleyway between stalls (Figure 3). When sows were trained to press the active button for access to more feed, they were fed only 70% of their standard gestation ration in the morning in order to facilitate training. Thereafter, a handful of gestation feed (30% of feed ration) was the reward. The position of the AB and DB was switched between training and testing for feed and access to time out of the stall.

Figure 2: Sow pressing the active button.

Figure 3: Sow walking in alley between stalls.

Once trained, sows were tested on an ascending schedule, where the number of AB button presses required by the sow was increased by 50% each day, starting at FR of 9, and increasing daily to a maximum FR. This produced a testing schedule of FR 9, 14, 21, 32, 48, 72, 108, 162, 243, 365 and 548.

In each 30 minute testing session, the animal was given a maximum of three consecutive opportunities to reach the required FR and obtain their reward. If an animal failed to reach the required FR within the 30 minute period, no reward was given. The animal was given a second opportunity to reach the required FR the following day, if the animal reached the required FR, testing continued along the schedule. If the animal failed to reach the required FR for a second day, testing ended. The total number of AB presses the animal achieved was regarded as a measure of the sows motivation.

All sows were fitted with accelerometers to record step counts as a measure of activity when out of the stall. Additionally, a camera positioned at one end of the alleyway recorded the behaviour of sows once out of the stall. During testing for motivation to exit the stall, the frequency and duration of sows seeking social contact, or seeking food was recorded.

(Are Sows Motivated ... continued on page 11)

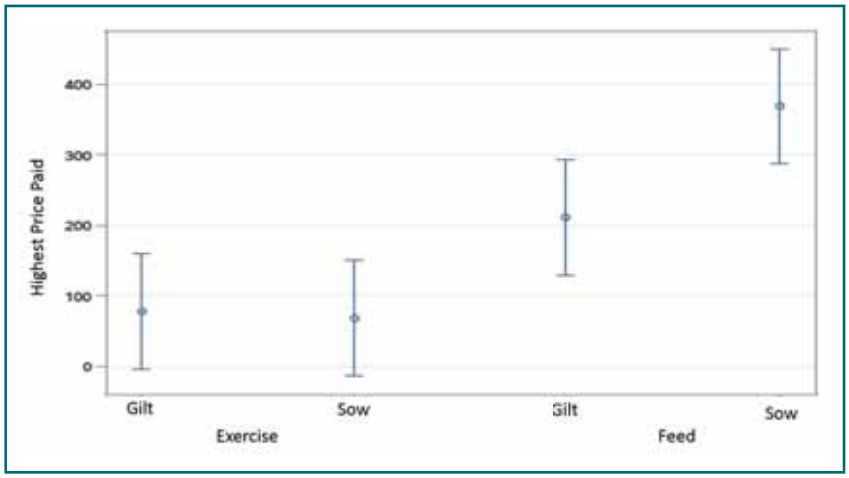


Figure 4: The Highest Price Paid for sows (n =12 and gilts (n = 12) to access time out of the stall (exercise) or a feed reward (feed), (least square mean and 95% confidence limits).

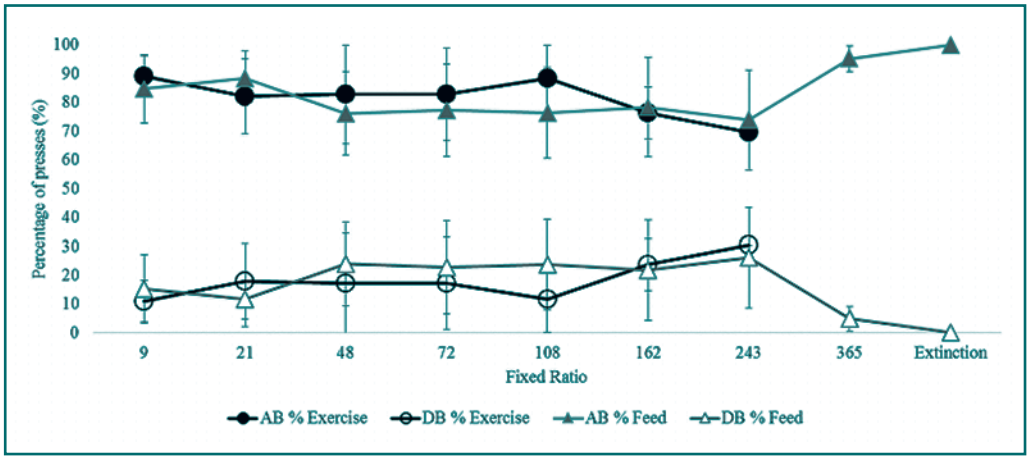


Figure 5. The mean percentage of total button presses in which the active button (AB) and dummy button (DB) was pressed when tested for access to time out of the stall (Exercise) and access to additional feed (Feed). Data from sows and gilts combined (n = 8).

Feeding straw to sows in late gestation.

Benefits to processing?

Atta Agyekum and
Denise Beaulieu.
University of Saskatchewan

Feeding fiber-rich diets to gestating sows may reduce the behavioral problems associated with restricted feeding, and improve sow and litter performance during lactation. However, these beneficial responses are not consistently observed. This probably related to differences in dietary inclusion rates and composition of the fiber, specifically the proportion of soluble to insoluble fiber. For example, sows offered diets rich in soluble fiber had an extended feeding time, delayed glucose and nutrient absorption, spent less time standing (Ramonet et al., 2000; de Leeuw et al., 2004) and showed reduced aggression (Danielsen et al., 2001) compared to a diet based on a less soluble mixed fiber. However, many of the fiber-rich ingredients available for inclusion in the diet of a gestating sow are high in insoluble fiber. There is work indicating that severe hydrothermal processing of fiber sources increases the solubility and improves the utilization of insoluble of fiber in pigs (de Vries et al. 2012). The overall objective of this study was to determine if feeding heat-treated straw to sows in late gestation would provide beneficial effects. We were especially interested in potential benefits to the piglets.

Experimental approach

This experiment was conducted at the Prairie Swine Centre, Saskatchewan, and utilized 150 sows (86 ± 2 d of gestation; 236.7 ± 32.4 kg BW; parity 0-5), 10 sows per week. Gestating sows were maintained in a free access stall system (Inn-O-Stall, Egebjerg International, Denmark) with 32 individual walk-in/lock-in stalls per group pen. Each stall (66 cm x 210 cm) is equipped with a feeder and nipple drinker. Sows were fed individually in stalls once per day, but were allowed to leave, with sows from various treatments mixed within the group. On d 110 of gestation, sows were moved from the gestation facility into a farrowing room containing 16 farrowing crates (183 x 244 cm each). Each crate was equipped with an individual bowl feeder and water nipple at the front.

> "gestating sows fed oat straw from day 86 of gestation to farrowing had increased feed intake post-farrowing and higher average piglet weaning weights."

The experiment used 5 dietary treatments; a standard gestation diet (Control) or the Control supplemented with processed or unprocessed oat or wheat straw at 10% of the daily feed allowance. The straw was ground using a tub grinder followed by further grinding through ¼ inch screen using a hammer mill. The processed straws were produced by hydraulically compressing straw through a briquette maker (model BP-100; Biomass Briquette Systems, LLCTM, Chico, CA, USA) at a temperature of about 80°C.

We intended to measure indicators of behavior, such as scratches and marks due to aggression, but this was terminated after the first couple of blocks because there was no indication

of fighting with any of the sows. However, as an indicator of treatment effect on satiety, feeding rate was estimated at 1300 h on d 18 (about d 100 of gestation) by measuring the time required to consume 200 g of the standard gestation diet offered to each sow at 6 h post feeding. Blood samples were obtained on d 100 of gestation at -5 (preprandial) and at 30, 60, 90, 120, 180, 240, 300, and 360 min post feeding from a catheter that had been inserted into an ear vein the previous day. Upon weaning, 3 piglets per litter with the BW closest to the average were selected, placed on standard diets. and followed from weaning to market.

The statistical analysis used 2 models. The first model assumed a randomized complete block design (RCBD) with 5 treatments, while the second model also used the RCBD but with 4 treatments arranged as a 2 × 2 factorial.

Results and discussion

Treatment had no effect on aggression; however, a non-competitive feeding system was used and the sows were grouped after receiving their morning feeding. This environment results in low overall aggression, making it difficult to detect treatment effects. There was also no effect of treatment on the time required to consume 200 grams of gestation diet provided to the sows 6 hours post-feeding. This test was used as an indicator of satiety, assuming that "hungrier sows" would consume the 200 grams more quickly. Six hours after the morning feeding may not be sufficient time to measure adequately this response.

As expected, dietary energy content was reduced with the addition of straw (Table 1, trt P < 0.001). Processing increased diet digestibility and thus energy content of the diet and this effect was greater with the oat straw than the wheat straw (S × P, P < 0.01).

(Feeding straw to sows ... continued on page 7)

Table 1. Total tract dry matter and energy digestibility and calculated dietary DE of the diets determined on approximately day 100 of gestation.

		Oat		Wheat			P value[1]			
Item	Control	Unproc	Proc	Unproc	Proc	SEM	Trt	S	P	S × P
N sows	10	9	10	9	9	-	-	-	-	-
Digestibility,%										
Dry matter	72.4[a]	60.0[d]	70.9[b]	68.8[c]	71.1[ab]	0.63	0.001	0.001	0.001	0.001
Energy	72.9[a]	58.7[d]	69.2[b]	67.3[c]	69.9[b]	0.80	0.001	0.001	0.001	0.001
DE, Kcal/kg	2,777[a]	2,234[d]	2,648[b]	2,576[c]	2,673[b]	30.5	0.001	0.001	0.001	0.001

a-d Means in a row within variables with different superscripts differ (P < 0.05). Values are means with pooled SEM for overall dietary treatments.

1 P-values: Trt = overall dietary treatment effect; S = effect of straw type; P = effect of straw processing; S × P = effect of interaction between straw and processing

Table 2. Lactation performance of sows who had received a control diet or diets supplemented with processed (Proc) or unprocessed (Unproc) oat and wheat straws during late gestation.

		Oat		Wheat			P value[1]			
Item	Control	Unproc	Proc	Unproc	Proc	SEM	Trt	S	P	S × P
N sows	10	9	10	9	9	-	-	-	-	-
Parity	2.1	1.9	1.7	2.1	1.6	0.33	NS	NS	NS	NS
Sow, Lactation										
ADFI [d] 1-7, kg/d	4.26	4.71	4.71	4.13	4.37	0.23	0.053	0.010	NS	NS
Piglets, n[2]	57	70	67	72	67					
Body weight, kg										
Weaning	7.03[b]	7.16[b]	7.51[a]	7.03[b]	6.93[b]	0.17	0.05	0.002	NS	0.056
Nursery exit	25.6[a]	24.1[c]	25.2[ab]	24.7[bc]	25.0[ab]	0.41	0.02	NS	0.03	NS

a-d Means in a row within variables with different superscripts differ (P < 0.05). Values are means with pooled SEM for overall dietary treatments.

1 P-values: Trt = overall dietary treatment effect; S = effect of straw type; P = effect of straw processing; S × P = effect of interaction between straw and processing

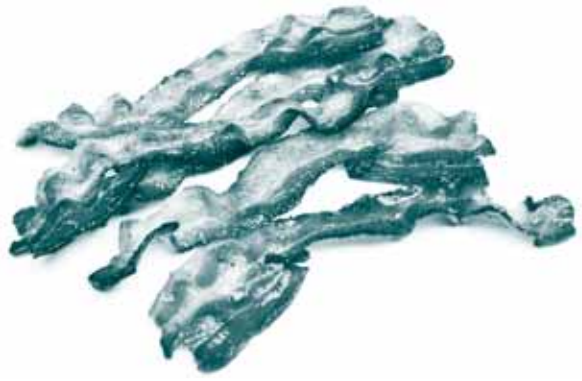
2 The number of piglets selected from each treatment and followed through to market

Pork quality and what it means for a healthy way of eating

Brian Sullivan, CEO, Canadian Centre for Swine Improvement

At the Canadian Meat Council's annual conference in May 2018, there was an interesting question from the audience following a presentation from Gary Taubes. "Should we be considering meat as a health food?" was the question. More interesting was Gary's response. "Yes, but it would be even more healthy if you would put some fat back into it". This was the second time for me to hear Gary Taubes speak, the first time being at the American Meat Science Association's annual conference in 2012. I remember it very well and the take home message was to reduce my carbohydrate consumption. My expectation was to curb my developing obesity and to reduce risk of metabolic disorders such as diabetes. Implicit in the message was to eat more meat. Gary was probably explicit about that. After all, this was a meat science conference. In any case, I was happy to start this experiment. From that day I switched my breakfast to bacon and eggs in place of cereal and toast. I also somewhat half-heartedly cut back on pastries and desserts, but honestly, breakfast was the only consistent change I was able to maintain. The good news was that my steady weight gain (2 to 3 lbs per year on average) stopped in its tracks. I actually lost a few pounds, but my hope of retreating to a more desirable (and healthier) weight was not to be, at least for the next five years.

After five years of enjoying breakfast more than ever (bacon and eggs every day!) my weight was stable but still significantly higher than I'd like. I'm at the Canadian Meat Council's annual conference in June 2017. One of the speakers was Nina Teicholz, Investigative Journalist & Author of the New York Times bestseller "The Big Fat Surprise". She ended her talk with the shocking conclusion (shocking for me anyway) that a healthy diet consists of low carbohydrate (no surprise), moderate protein (of course) and a high amount of fat (say what?). Following the conference, I checked out an audio-book version of Nina's "The Big Fat Surprise" from our local library. You can probably find it at your own library, but don't be "surprised" if there's a waiting list. I listened to this book on my daily commutes to work and finally a light bulb went on in my head. This was the missing point that, in retrospect, I'm now certain Gary Taubes was also making when I heard him in 2012. It also explains why this year, in answer to the question about meat being a health food, he responded "Yes, but it would be even more healthy if you would put some fat back into it".



Back in 2012, the idea of increasing fat consumption didn't come across, or at least never got through to me. I suspect that I was no exception. Cutting out carbohydrates, sure. A no brainer. However, the idea that eating fat might be ok, never mind healthy, just never dawned on me. It just seems so logical that weight gain (or loss) can be predicted by the equation "energy consumed in our diet minus energy burned" which we all know and understand. Eat more than we burn and we get fat. Burn more than we eat and we lose weight. As logical as that seems, Gary makes a very compelling argument that this simple

hypothesis just isn't supported by data. How many people are successful with sustained weight loss through counting calories or exercise programs? How many billions of dollars are spent unsuccessfully on these types of weight loss programs? How many billions more on treatments for metabolic disorders like diabetes. If you want to know more details, have a look at Gary's 2012 presentation titled "Why We Get Fat: Adiposity 101 and the Alternative Hypothesis of Obesity". It can be found at https://meatscience.org/publications-resources/rmc-proceedings/2012. My simple understanding of the alternative hypothesis is that eating carbohydrates stimulates insulin release; insulin results in energy moving from our blood into fat reserves; sustained high levels of insulin may also increase risk of diabetes; eating fat does not stimulate insulin release; and eating fat rather than carbohydrates appears to avoid the undesirable effects we get from excessive carbohydrates. What does all this have to do with pork quality? Well, what if it turns out that Gary and Nina are absolutely correct? What if a healthy diet really is low in carbohydrates, moderate in protein and high in fats? If so, then we should be thinking about fat when we think about high quality pork. We need to get past the idea that lean is healthy, and that pork is simply a good source of protein. Pigs are very good at turning carbohydrates into healthy fats for human consumption. Imagine the possibilities of what we can do with pork cuts if fat goes from villain to hero.

If you are attending Banff Pork Seminar in January, there will be a break out session on "Meat Quality". I'll talk about pork as more than a good source of protein and some related opportunities that may lie ahead for the Canadian pork industry. I'll also share the rest of the story on my journey with eating more fat in place of carbohydrates over the past 18 months. As a teaser, I'm quite happy to be a guinea pig experimenting on this different way of eating. The other speaker in the session will be Michael Young from Canada Pork International. Michael will talk about what customers around the world look for in Canadian pork, followed by a pork cutting demonstration. It's worth noting that some of the customers who pay the most for Canadian pork require a healthy balance of protein and fat in the product, and they would like even more fat. There is opportunity to learn from these markets and learn from Michael how to work with a variety of pork cuts, especially those higher in fat. The result could lead you to a more enjoyable and healthier pork eating experience and increased market value for Canadian hogs. Hope to see you in Banff!

(Feeding straw to sows ... continued from page 5

Pre- and post-prandial plasma glucose tended to decrease with processing in the wheat, but not the oat straw ($P \times S$, $P < 0.10$, data not shown) and this effect was more apparent in the preprandial samples. This, combined with the effects on digestibility, indicates that processing had a greater effect on the solubility of fiber in the oat, relative to the wheat straw.

Supplementing the gestation diet with processed straw during late gestation had no effect on litter size or piglet birth weight (Table 2). However, piglet weaning weights were improved with the oat straw supplementation (S, $P < 0.01$) and there tended to be a further improvement when the oat straw was processed ($S \times P$, $P = 0.06$). This observation could be a reflection of the improved feed intake for the sows during the initial 7 days post-farrowing that was observed with the oat straw supplementation (S, $P < 0.01$; Table 2). The improvements observed with straw processing were still evident at nursery exit ($P < 0.03$); however, piglets on the control treatment had similar nursery exit weights as piglets from sows receiving processed oat or wheat straws. Finally, treatment had no effect ($P > 0.10$) on market weight or yield, dressing or carcass yield %, mm back fat or loin depth.

Summary and Conclusions

Although data on aggression and/or satiety was not conclusive, processing the oat straw increased plasma glucose, whereas the opposite effect was observed with the wheat straw. Moreover, gestating sows fed oat straw from day 86 of gestation to farrowing had increased feed intake post-farrowing and higher average piglet weaning weights. In our study, oat but not wheat straw provided benefits for gestating sows and there was some indication that further benefits could be obtained through processing.

Acknowledgements

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Finishing Facilities

Ken Engele,
Prairie Swine Centre

In 2017, on-farm best management practices were audited on a total of 24 farms throughout Canada as part of a national project titled From Innovation to Adoption: On-farm Demonstration of Swine Research. This article is part of an eight-part series reporting on these audits.

Successfully managing finishing facilities requires attention to detail on a daily basis. Due the length of the finishing period and the percentage of total resources used, small changes will have a large impact on the profitability of the operation.

A total of 16 finishing facilities were audited achieving a score of more than 80% (for the adoption of best management practices) in a number of key areas. As with nursery facilities, one possible area of improvement is increased adoption of enrichment, as only two thirds of farms currently utilize enrichment in finishing pens. Other areas of consideration should be the re-assessment of sorting pigs and additional water availability.

Enrichment

Based on audit data, the use of enrichment in finishing facilities is one area that requires some attention. As showed in Table 1, data suggests that only 65% of farms audited currently incorporate enrichment in their finishing facilities, with chains being the most common form of enrichment (70 %) followed by wood (30 %). Support tools for the successful incorporation of enrichment are available through the Code of Practice for the Care and Handling of Pigs (Appendix H).1, 2, 3

Feeder type and Water availability

As seen in Figure 1, a vast majority of the audited producers have adopted wet/dry feeders, which have been shown to increase pig performance. Approximately 50 % of the audited

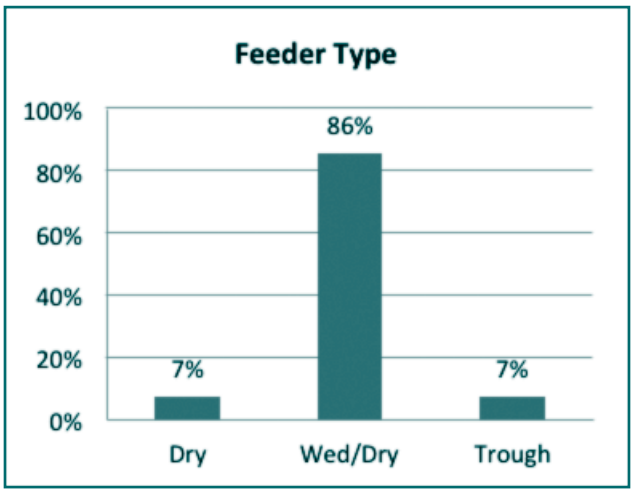

Figure 1. Feeder types used in finishing barns

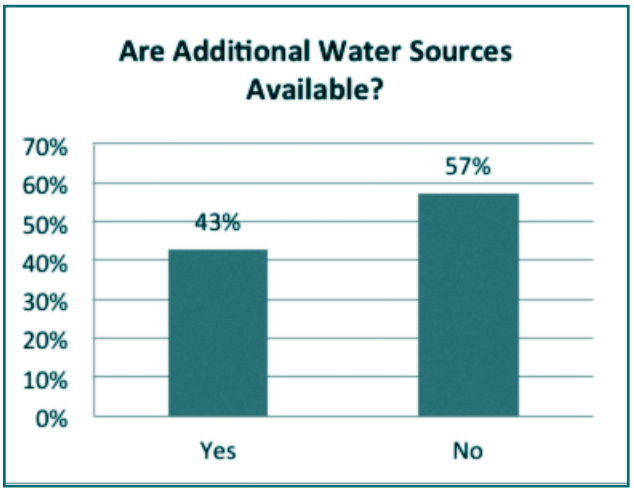

Figure 2. Availability of additional water sources in finishing pens

producers utilize the feeder as the only source of water within the pen (Figure 2). In some situations it has been shown that reduced floor space allowance may negatively affect growth performance, due to decreased access of feed and water, especially at later stages of the grower-finisher period. Producers should consider increasing the number of water sources, as research has indicated that adding one extra drinker resulted in a significant improvement in average daily gain and feed efficiency as well as reduced average daily feed intake.[4]

> "research indicates that adding one extra drinker resulted in a significant improvement in average daily gain and feed efficiency"

Sorting pigs

Results from the audit indicate that approximately half of participating farms sort pigs when transferred into the finishing barn. There are multiple factors to consider when deciding to sort or not at this phase. Research indicates that finisher pigs fed ad libitum do not benefit from sorting.[5] However, sorting on the basis of nutritional needs can be effective in cases such as split-sex feeding, as well as for newly-weaned pigs, in order to provide the best diets to each group.

Conclusion

Overall, pork producers are doing an excellent job in ensuring best management practices are implemented on-farm within finishing facilities. Some farms could see potential benefits by a focusing on areas of lower ratings (enrichment, sorting, water availability) and assessing how to best incorporate them into their operations. Take a look at the 'For Further Reading' section to learn more about these possible improvements.

For Further Reading

1 Enriching the living space of pigs to comply with the Code (English) http://www.cdpq.ca/getmedia/cefa398c-ba4d-46c8-a1a0-ad5c04574e1c/Fiche-enrichissement-version-anglaise.pdf.aspx

2 Enrich the living space of pigs in order to come up to code (Français) http://www.cdpq.ca/publications-et-documents/publications-techniques-et-scientifiques/enrichir-l-espace-de-vie-des-porcs-pour-respecter.aspx?lang=en-CA

3 Code of practice for care and handling of pigs (English) http://www.nfacc.ca/pdfs/codes/pig_code_of_practice.pdf (Français) http://www.nfacc.ca/pdfs/codes/porcs_code_de_pratiques.pdf

4 The Effects of Water Availability and Space Allowance on Productivity and Profitability (English) http://www.prairieswine.com/water-availability-and-crowding/

5 Sorting Pigs: Why We Do It, and Why We Shouldn't (English) http://www.prairieswine.com/sorting-pigs-why-we-do-it-and-why-we-shouldn-t/

Table 1. Audit results of 16 finishing facilities across Canada

Category	Average Percentage of Farms		
Pigs sorted by size It is recommended not to sort pigs by size in finishing	53 %	47 %	0 %
Number of Diets/Phases It would be recommended to have a minimum of 3 grower-finishing diets	88 %	12 %	0 %
Type of enrichment used It is recommended that enrichment be used in individual pens.	65 %	35 %	0 %
Euthanasia method used Pig must be rendered immediately insensible - must not return to sensibility prior to death.	100 %	0 %	0 %
How often are pen walked? It would be recommended to walk pens on a daily basis	82 %	18 %	0 %
Split sex feeding implemented It's recommended to split- sex whenever possible.	11 %	89 %	0 %
Phytase included in diets Recommendation: include phytase in all diets.	80 %	2 %	20 %

Legend
Meets recommendation
Partially meets recommendation
Does not meet recommendation

Managing Water Intake
Auditing Best Management Practices - Part 8

Ken Engele,
Prairie Swine Centre

In 2017, on-farm best management practices were audited on a total of 24 farms throughout Canada as part of a national project titled From Innovation to Adoption: On-farm Demonstration of Swine Research. This article is part of an eight-part series reporting on these audits.

Among nutrients, water is required in the greatest amount but quite often receives the least attention. Water intake of finisher pigs has been reported to range up to three times feed intake, depending on body weight and feed intake. However, most 'water intake' reported is in the form of water disappearance from drinkers, including water wastage, rather than water actually consumed by pigs. Previous work has shown finishing pigs can waste 25% of water from well-managed nipple drinkers, therefore opportunities exist to reduce wastage when flow rates are adjusted on a regular basis[1]. Actual on-farm water flow rates and nipple drinker heights were measured on 24 farms across Canada, representing each phase of production from gestation to finishing. Note that not all farms had nipple drinkers installed in each phase of production, for example, some producers solely relied on wet/dry feeders without an additional water source.

Table 1 outlines water flow parameters showing ranges measured for low, target, high, and very high values. Recommended flow rates should range between 1.0 to 2.0 L/min and 0.5 to 1.0 L/min for farrowing and all other phases of production respectively, while the target range used in the analysis was expanded from 0.5 to 1.5 L/min for all areas other than farrowing.

Table 1. Water Flow Rate Recommendations

	Low (L/min)	Target (L/min)	High (L/min)	Very High (L/min)
Gilt Pen	< 0.5	0.5 - 1.5	1.5 - 2.5	> 2.5
Gestation	< 0.5	0.5 - 1.5	1.5 - 2.5	> 2.5
Farrowing	< 1.0	1.0 - 2.0	2.0 - 3.0	> 3.0
Nursery	< 0.5	0.5 - 1.5	1.5 - 2.5	> 2.5
Finishing	< 0.5	0.5 - 1.5	1.5 - 2.5	>2.5

Prairie Swine Centre. 2000. Pork Production Reference Guide.[2]

Overall water management within audited farms varies across phase of production (Table 2). Generally producers do a better job in managing flow rates within Gestation (pens) and Nursery, where approximately 60% of the nipple drinkers measured met the target flow rate. The challenge is in Finishing, where approximately two-thirds of nipple drinkers provide flow rates in excess of pig's requirement, with 11% of nipple drinkers being rated very high (>2.5 L/min).

Economics

Table 3 represents a hypothetical situation of a 6,000-head finishing barn. In this case, if 100% of the nipple drinkers were adjusted to recommended flow rates (1L/min) and we assumed that there was no wastage, water consumption would be 42,000 L/day for the facility. However, as shown in the example in Table 3, only 29.3% of nipple drinkers would have been optimally adjusted. For this scenario, we can assume that any water disappearance above the rate of 7 L/day would be considered as wasted water. Therefore, the daily water disappearance would increase by 70% (or 29,642 L) to reach a total disappearance of 71,642 L/day. The direct cost of water wastage (29,642 L) associated with manure disposal would translate into approximately $114/day or $40,000 per year if the previous assumptions were met.

Assumptions

- 6,000 head finishing barn
- Average daily water consumption per pig - 7L/day
- Manure application cost - $0.0175/gallon or $0.00385/litre

The previous example provides potential savings for a hypothetical site; every producer should take the opportunity to assess potential savings related to manure disposal, water use, and pumping costs on a regular basis for their operation.

Conclusion

Finishing pigs can maintain adequate water intake from a variety of drinker types, however water waste from drinkers can be very different depending on drinker type and management. Research has shown well-managed nipple drinkers can reduce water waste to the same level as bowl drinkers.[1, 3]

Properly mounting nipple drinkers will reduce water wastage.[4] Nipple drinkers mounted at 900 should be set to shoulder height, while nipple drinkers mounted at 450 should be set to 5cm (2 inches) above the back of the smallest pig in the pen. It is important to note that mounting nipple drinkers

lower than required will increase water wastage. Finally, ensure you regularly check water flow rates, as this will determine time spent at the nipple, water intake and water wastage. Too little is just as costly as too much when it comes to flow rates.

For Further Reading

1 Water Usage and Wastage from Nipple Drinkers
(English) http://www.prairieswine.com/water-usage-and-wastage-from-nipple-drinkers/
2 Pork Production Reference Guide
(English) http://www.prairieswine.com/wp-content/uploads/2010/07/2000_Prairie_Swine_Reference_Guide.pdf
3 Effects of nipple drinker height and flow rate on water wastage in grower and finisher pigs
(English) http://www.prairieswine.com/reducing-water-wastage-from-nipple-drinkers-by-grower-finisher-pigs/
4 Recommended Flow Rate & Height of Nipple Drinkers
(English) http://www.prairieswine.com/recommended-flow-rate-height-of-nipple-drinkers/
5 A Checklist for Water Use
(English) http://www.prairieswine.com/a-checklist-for-water-use/

Table 2. Measured Water Flow Rates – 24 audited farms

	Low (<0.5L/min)	Target (0.5 – 1.5 L/min)	High (1.5 – 2.5 L/min)	Very High (>2.5L/min)
Gilt Pen	5.1%	33.3%	56.4%	5.1%
Gestation	0.0%	59.4%	21.9%	18.8%
Farrowing	15.3%	38.9%	29.3%	16.6%
Nursery	15.2%	56.8%	19.0%	8.9%
Finishing	5.4%	29.3%	54.3%	10.9%> 2.5

Table 3. Hypothetical water disappearance measurements

	Low	Target	High	Very High
Measured Values**	5.4%	29.3%	54.3%	10.9%
Water Flow Rate (L/min)	0.5	1.0	2.0	2.75
Number of Pigs	324	1,758	3,258	654
Daily Water Disappearance /Pig (L/pig)	3.5	7	14	19.25
Total Daily Water Disappearance/Day (L)	1,134	12,306	45,612	12,590

** Refers to the percentage of nipple drinkers that were measured in each respective category. A total of 24 farms were measured across Canada.

L/Day	
Calculated Water Disappearance	71,642
Target Water Disappearance	42,000
Water Wastage	29,642
Additional Manure Disposal Cost/Day	$114.12

(Are Sows Motivated ... continued from page 3)

Results and Discussion

Sows showed a greater highest price paid for feed, than movement, but for gilts the highest price paid for each reward did not differ. Sows also showed a greater highest price paid to access feed than gilts. However, the highest price paid for movement did not differ between sows and gilts.

Additional control sows were presented with the operant panel for 30 minutes for seven consecutive days, with no rewards. Initially they interacted with the panel, generating total push counts on day 1 within the range of the HPP by sows and gilts for access to time out of the stall. However, over the course of six days repeated presentation, total interaction with the panel reduced. In contrast, sows trained to associate interaction with the panel with generating a reward maintained levels of interaction with the panel over consecutive days, and as the FR increased (Figure 5).

Conclusions

Results suggest that stall-housed sows and gilts are motivated to access time out of their stall. The levels of motivation for both rewards are equal in gilts, but in sows the motivation for movement is moderate when compared to their greater motivation for feed. The greater motivation to receive a feed reward in sows may be because they were recovering from lactation during the testing period. To provide more substantial evidence on which to base Code recommendations, further studies will be done to examine sows' motivation to exit the stall at different feeding levels, and a comparison of the impact of weekly exercise compared to group housing and stall housing on sow behaviour and production when fed at different feeding levels.

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Personal Profiles

Michael Bosompem

Michael Bosompem graduated from the University of Ghana, Legon with a Bachelor of Science degree in Agriculture (Animal Science major). He then worked with the Government of Ghana at the district level as an Agric extension agent from October 2013 through August 2014. He later joined GCB Bank (Erstwhile UT Bank) from October 2014 until September 2017 where he advised the bank on technical agricultural issues relating to Argic financing products. Michael is originally from the Eastern Region of Ghana but has lived in Accra almost all his life. In September 2018, Michael joined the University of Saskatchewan where he is currently pursuing a master's degree in Animal Science under the supervision of Dr. Dan Columbus (Prairie Swine Centre, Inc). His project will focus on the "Long term feeding of graded levels of Deoxynivalenol (DON) in Grower-Finisher pigs" and is funded by the Agriculture Development Fund (ADF) - Government of Saskatchewan, Saskatchewan Barley Development Commission, and BIOMIN Holding GmbH. Ultimately, this project seeks to determine the economic viability of feeding mycotoxin-contaminated diets in grower-finisher pigs. Michael's career goal is to become a monogastric nutritionist in the industry or academia and he believes the University of Saskatchewan and the Prairie Swine Centre, Inc are the best training grounds to achieve this."

Coming Events

Banff Pork Seminar
January 8-10, 2019
Banff, Alberta

Manitoba Swine Seminar
February 7-8, 2019
Winnipeg, Manitoba

Cramer Ag Expo
February 21, 2019
Swift Current, Saskatchewan

Alberta Livestock Care Conference
March 20-21, 2019
Olds, Alberta

MB Pork Council AGM & Banquet
April 11, 2019
Winnipeg, Manitoba

2018 Saskatchewan Pork Symposium

Student participating in the 2018 Saskatchewan Pork Symposium

Congratulations to Lee Whittington, on receiving a lifetime achievement award at the Saskatchewan Pork Symposium.

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