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PRAIRIE SWINE CENTRE

Spring 2020 Volume 27, Number 1

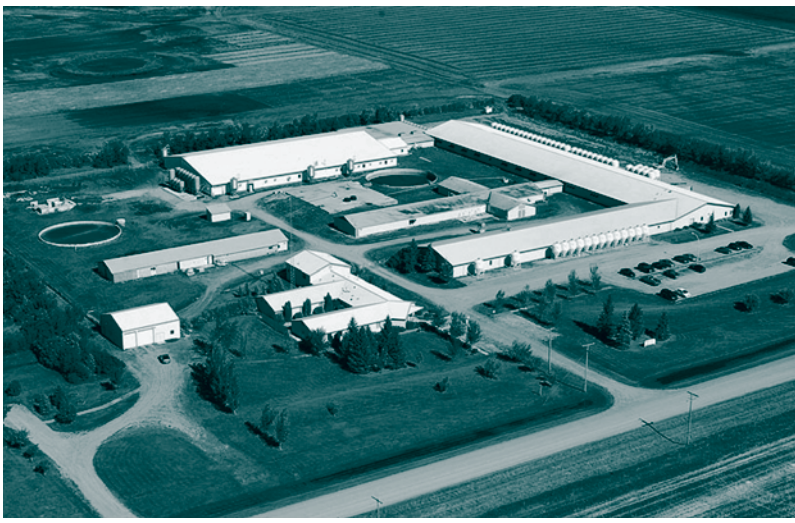
A Message to All Our Stakeholders Regarding COVID 19

Murray Pettitt, CEO, Prairie Swine Centre

With the continuing global and provincial spread of COVID-19 it is important that we all do what we can to help reduce the spread of this virus. Prairie Swine Centre takes our obligations and commitments to our employees, our animals, producers, funding agencies and the Canadian pork industry very seriously, and have implemented several precautionary measures within our business structure.

As a leader within the Canadian pork industry, over time, we have developed a system of policies and procedures that help us best manage events seen today. We continue to build on these habits to ensure everyone remains safe and healthy throughout this critical period. Biosecurity programs developed throughout the pork industry are serving all of us well. Not only do they protect our animals, they better enable us to prepare for challenges identified in the coming days and months.

The role of Agriculture, and the pork industry, is never more important as we provide an essential service to all Canadians. Throughout these challenging times, Prairie Swine Centre will



continue to operate and carry out research, but we are taking several precautionary steps in our business and operating practices. As more information on this virus is available, we will continue to assess and adapt. The following measures have currently been adopted at the Centre:

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Motivated for Movement - What is the Cost of Sow Exercise?

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Preliminary sow performance measures suggest exercising stall-housed gestating sows for 10 minutes, once per week has minimal effects on the productivity of younger sows, but may have a positive effect on older parity sows - increasing the number of live born and reducing stillborns. With productivity effects limited to a portion of the sow herd, exercising sows will result in increased costs of production by approximately $2.00/hog, mainly due to the additional labour required.

Results also indicate sows and gilts have a moderate level of motivation to obtain time out of their stall; sows and gilts trained to associate pressing a button with receiving a reward, will work moderately hard to obtain time out of their stall, as measured by their highest price paid (HPP – total number of button presses to obtain a reward). However, sows show a greater level of motivation to access a feed reward, and providing high fibre feed to sows reduces their motivation to exit the stall. Despite the provision of ad-libitum high fiber feed, a level of motivation to exit the stall remains, with sows continuing to interact with the operant panel. This suggests there can remain an intrinsic level of motivation for time out of their stall, or control over their environment. Results of sow behaviour when outside of the stall, and physiological measures collected over gestation need to be included, to draw full understanding on the motivation of sows to exit their stall, and the influence on sow welfare.

The Canadian Code of Practice for the Care and Handling of Pigs requires that from July 1, 2024, all mated gilts and sows must be housed in groups, or individual pens. The 2014 Code proposes that mated gilts and sows can 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.

Figure 1. A) The operant panel containing two identical buttons, a central divider, and a light (central dot above divider) to indicate to the sow when the panel is active. B) Sow pressing the active button (results in a reward) of the operant panel, hung over her stall gate.

Currently, there is a lack of scientific evidence on which to base a recommendation on what constitutes an acceptable greater freedom of movement for stall-housed sows. Additionally, whether periodically providing stall-housed sows with opportunities for a greater freedom of movement will benefit sow welfare and productivity is unknown. This research project aimed to address specific knowledge gaps to support informed decision making. Research questions focussed on understanding:

1. How motivated are sows to receive time out of their stalls?
2. How is the motivation of restricted fed sows, to exit the stall, influenced by diets that will influence hunger?
3. Does providing a low level of exercise (10 minutes once per week) benefit the welfare and productivity of stall-housed gestating sows?

Results

i) The motivation of sows and gilts to exit their stall:
Stall-housed sows were trained to associate pushing one of two buttons on an operant panel (Figure. 1) to request access to rewards; a) time out of their stall (movement) or b) a small feed reward (food). Results found that both sows and gilts show a level of motivation to exit the stall, as indicated by how hard the animals 'worked' – the Highest Price Paid (HPP): the total number of button presses to receive the reward (Figure 2). However, sows displayed a greater motivation to access a feed reward than to exit the stall. This greater motivation for feed may result from sows recovering from lactation at the time of testing.

The motivation of gilts to access feed was significantly lower than sows, with the level of motivation to exit the stall between sows and gilts being no different (Figure 2). That gilts showed an equal level of motivation to receive feed as to exit the stall, may indicate that gilts, who were stall-naïve at the start of the trial, value opportunities for each reward equally.

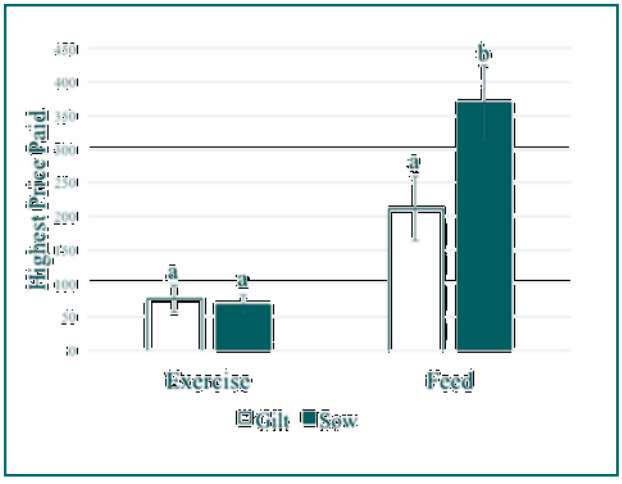

Figure 2. The highest price paid (mean ± SEM) for sows (n =12) or gilts (n = 12) to access time out of the stall, or a feed reward. Where superscripts differ, P<0.05.

(A Message to All Our Stakeholders... cont'd from page 1)

- The management team at the Centre has developed a COVID-19 response plan ensuring continuity of operations and research programs, including planning and implementing new preventative measures.
- We have created a work from home plan for all staff possible.
- We have incorporated split shifts and physical distancing protocols in the research/production facility in order to reduce the number of staff present at one time and the frequency of face to face interactions. Improved cleaning and disinfection protocols have been implemented.
- We have suspended all company travel.
- We require all staff who are returning from international travel to self-isolate for 14 days.
- We have restricted all individuals and companies from entering the Prairie Swine Centre office and production facility.
- We have eliminated in-person meetings, utilizing electronic and video communication when required.
- We continue to monitor and follow the recommendations of the appropriate public health agencies.

Prairie Swine Centre will continue to be a resource for the swine industry.

Finally, we encourage everyone to monitor and stay on top of the ever-changing environment.

Stay safe out there.

Murray Pettitt,
CEO
Prairie Swine Centre

ii) The influence of high fibre feed on the motivation of sows to exit their stall

Sows were trained to use the operant panel to work for time out of their stall, when fed one of three diets, designed to influence hunger levels.

Results suggest that providing ad-libitum high fibre feed in addition to the standard gestation ration reduces the motivation of sows to exit their stalls (Figure 3). This implies a desire to seek additional feed may be an influence on the motivation of sows to exit their stalls. However, whether fed a high fibre feed at 50% of their ad-libitum, or full ad-libitum intake level, sows still showed a level of interaction with the operant panel, which may suggest that the provision of the panel also provides an enrichment for exploration when presented in the stall. That

(Motivated for Movement ... continued on page 4)

(Motivated for Movement ... cont'd from page 3)

sows fed additional high fibre feed worked to a moderate HPP to exit the stall may also suggest there remains an intrinsic level of motivation for sows to access time out of the stall. Analysis of sow behaviour when outside of the stall still needs to be completed. This will provide useful information that will support a better understanding on what may be motivating sows to exit the stall.

iii) Low level exercise on the productivity of stall-housed gestating sows

Results from the third experiment indicate that providing stall-housed gestating sows with 10 minutes of exercise once per week benefitted only the performance of older parity sows, indicating they may benefit from increased movement. However, we did not see measurable benefits from exercise in younger sows, as they tend to be in better physiological condition. Old parity sows that were group-housed, or stall-housed with weekly exercise had a greater number of live born piglets compared to sows housed in stalls throughout gestation (Figure. 4). Additionally, stall-housed old parity sows had a greater number of stillborns than sows that were stall-housed and received weekly exercise, or group-housed over the course of gestation (Figure. 5).

Still to be analysed include measures of sow behaviour, physiology and gestational stress of the sow and her piglets. Considered together, the results will provide a comprehensive information on how periodic exercise influences sow welfare and productivity.

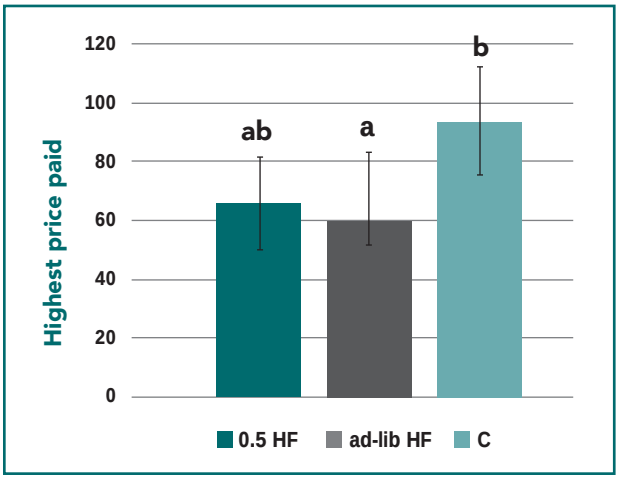

Figure 3. Highest price paid (HPP) for sows tested for their motivation to exit the stall for exercise when provided their standard gestation ration (Control, C, n = 14), provided with half of their ad-libitum daily high fibre feed intake in addition to their gestation ration (0.5 HF, n = 14) and provided ad-libitum access to a high fibre feed in addition to their gestation ration (ad-lib, n =14), (mean ± SEM). Where superscripts differ, P<0.05.

Economic Assessment

If producers decide to exercise their sows and keep the stall-based system, at what point in time does it pay to make the conversion to group sow housing? This decision is farm dependant, and determined by a number of factors including the availability and cost of labour and expected renovation cost to make the transition to group sow housing. Results indicate if sows were given 10 minutes of exercise, once per week, we will also see an increase in performance (2 pigs per litter) in older

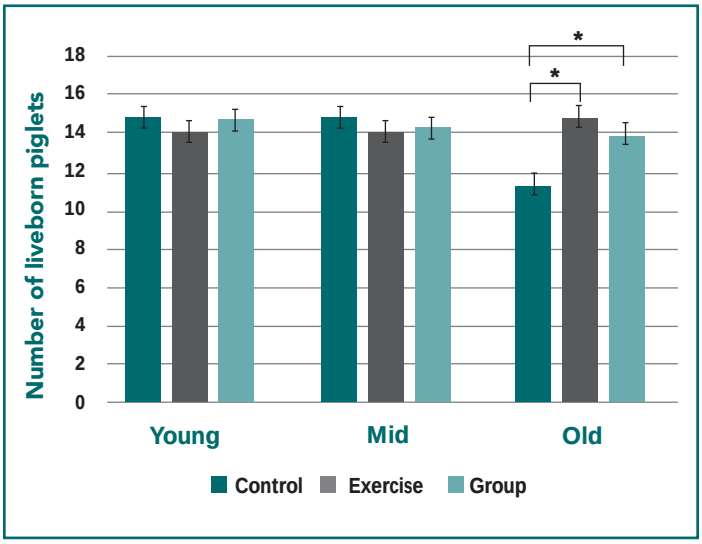

Figure 4. Number of liveborn piglets (mean ± SEM) for sows belonging to young (parity 0-1, n = 49), mid (parity 2-4, n = 95), and old (parity 5-7, n = 24) parity groups from control, exercise, and group treatments. Brackets connect treatments with significant differences,* P <0.05.

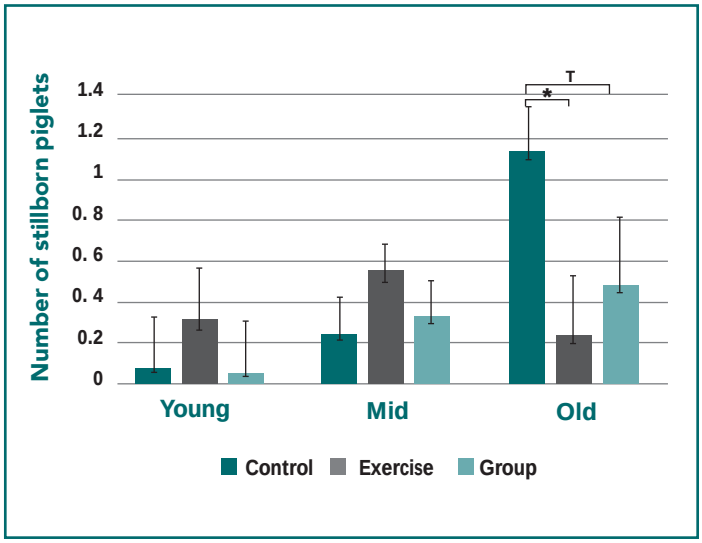

Figure 5. Number of stillborn piglets (mean ± SEM) for sows belonging to young (parity 0-1, n= 49), mid (parity 2-4, n = 95), and old (parity 5-7, n =24) parity groups from control, exercise, and group treatments. Brackets connect treatments with significant differences.* P <0.05; T: Tendency, P = 0.08.

parity sows. Taking these factors into account, we can estimate a payback in making the conversion to group sow housing.

Table 1 estimates the increase in total productivity, additional labour requirement and the cost associated with exercising sows in a 1,200 - sow operation. Assuming parity 5+ sows have greater productivity with exercise (2 pigs per litter), and represent 26.5% of the herd, this operation would produce an additional 1,282 pigs annually. However, this needs to be off set by the additional labour required for sow exercise. Based on a labour requirement of 10 minutes per sow/week this facility would require an additional four people in order to ensure all gestating sows would receive the appropriate amount of exercise on a weekly basis. Assuming an hourly labour rate of $15 per hour, we would need to spend an additional $2,450 per week or $127,400 annually on sow exercise. The overall impact to the operation would be an increase in the cost of production of $2.00 per - hog marketed; where the addition labour (for sow exercise) adds $2.94 per hog in cost, but the increase in production reduces fixed costs by $.94/hog.

"Exercising sows will result in increased costs of production by approximately $2.00/ hog, but what are the benefits? "

Figure 6 examines the impact of costs associated with sow exercise and the impact on spending that money to make the conversion to group housing. By looking at different costs of conversion and labour rates, we can identify specific trends. Overall, there is direct relationship between the cost of conversion to group sow housing and payback regardless of labour rate. In another words, producers would be encouraged to make the transition to groups sooner than later, the cheaper the conversion process becomes, as the payback to investment is better. The lower (better) the payback the more incentive producers have to spend money on their facilities rather than additional labour.

An inverse relationship exists between payback (in years) to group sow housing and the cost of labour ($/hour). As the labour rate increases producers will need to spend more money on labour in order to accomplish the same task (sow exercise), in a stall-based system. Based on information in Table 1, if we increased the labour rate from $15 to $30 per hour our total labour expense for the year would double, increasing by an additional $127,400. Looking at a specific example (Figure 5.), if we assume the cost of conversion (to group sow housing) is $500 per sow place, payback improves from 7.5 years to 2.5 years when labour rates increase from $15/hour to $30/hour respectively. This is a three-fold increase to payback when labour rates double.

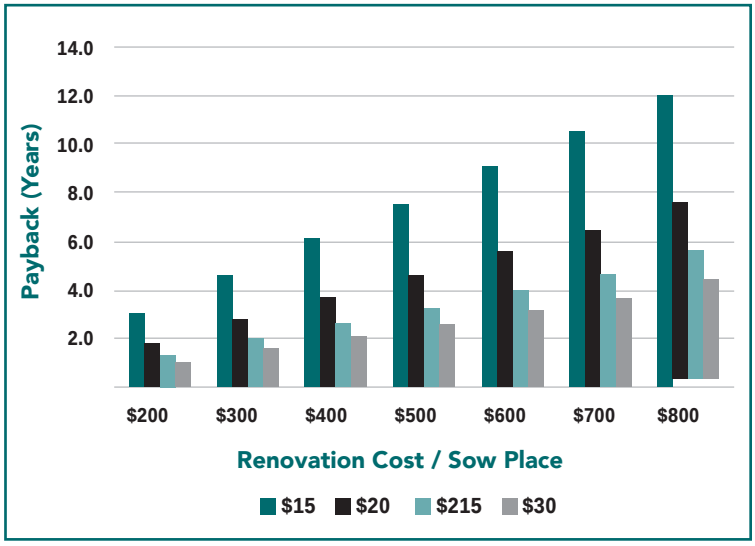

Figure 6. Impact of Labour Rate ($/hour) and Renovation Cost ($/sow place) on payback (time) required in making the conversion to group sow housing.

Table 1. Sow Exercise – Productivity Impact

Parity 5+ (%)	26.5%	of sow herd
Parity Impacted (5+)	318	sows
Pigs Sold/Sow	4.03	per year
Total Pigs Sold	1,282	per year
Farrowing Crates Required	55	per week
Sows requiring exercise	980	per week
Total time required	163.3	hours/week
Additional Staff Required	4.1	
Labour Cost	$ 15	per hour
Total Labour Cost for Exercising	$ 2,450	per week
Total Labour Cost for Exercising	$ 127,400	per year

Overall, as labour rates increase and renovation costs decrease producers should seriously consider re-investing in their operations. At some point, money spent on additional labour may be better re-invested in your facility. While each situation is unique, producers must calculate their own individual payback and consider where to spend their next dollar.

Acknowledgements

We would like to acknowledge the financial support for this research project from the Saskatchewan Agriculture Development Fund, Sask Pork and Alberta Pork. The authors would also like to acknowledge the strategic program funding provided to the Prairie Swine Centre by Sask Pork, Alberta Pork, Ontario Pork, the Manitoba Pork Council and the Saskatchewan Agriculture Development Fund.

Making Cents of Enrichment

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What would you think if I told you installing enrichment would improve the financial position of your operation? Enrichment seems to be one of those things that can be easily over looked. The National Farm Animal Care Council's 2014 update to the Canadian Code of Practice for the Care and Handling of Pigs states that all pigs must have "multiple forms of enrichment that aim to improve the welfare of the animals through the enhancement of their physical and social environments." While implementing enrichment on-farm is simple in nature, the proper selection, installation and maintenance of enrichments can have a positive impact to the bottom line of your operation. The lack of enrichment is known to result in more problematic behaviours such as tail-biting and belly-nosing and there is a need for practical and cost-effective solutions that producers can implement.

Why is it important?

Overall, the purpose of enrichment is to improve the living conditions of pigs, by encouraging the expression of a wider range of normal pig behaviours. From a practical viewpoint, it is providing objects or materials for proper investigation and manipulation in order to keep pigs occupied to prevent future harmful behaviours. As defined by the Code, enrichment is a way of changing the environment of pigs to their benefit.

Benefits of Enrichment?

Why worry about enrichment? The overall goal of enrichment is not to make more work for producers. Rather the goal is to improve the environment of the pig, in a manner where producers also receive numerous benefits. Goals of incorporating enrichment include:

- Reduce the frequency of abnormal behaviour (tail biting, biting, aggression)
- Increase the pigs' ability to deal with challenges in a much more normal way
- Broaden the range of behaviours expressed
- Improve animal performances (feed intake, average daily gain (ADG) and feed conversion ratio (FCR))
- Boost positive use of space
- Reduce stress in the animals

Results from a recent project at Prairie Swine Centre showed that piglets given enrichment before weaning showed less pen-mate manipulation (tail-biting, ear-biting, belly-nosing, etc.) and tended to fight less at weaning than the other pigs. This is important because weaning is stressful for piglets, so anything that can help to reduce weaning stress has the potential to benefit their health, welfare, and productivity throughout the nursery and beyond. Similarly, piglets provided enrichment only in the nursery had fewer head and shoulder lesions at four weeks post-weaning than the other groups, indicating that they fought less towards the end of the nursery phase. Additionally, pigs given enrichment spent more time exploring their pens at three weeks post-weaning, indicating that they were more engaged with their surroundings. Pigs enriched post-weaning also showed reduced fear of humans, which has implications for both welfare and ease of handling.

How well are we doing?

A project funded by Swine Innovation Porc (2018) examined the auditing of best management practices on farms across Canada, with enrichment being one of the parameters measured. Based on audit data, providing enrichment in the nursery and finishing are areas that require additional attention from pork producers. As seen in Figure 1, only 11 % of farms audited incorporated enrichment into nursery facilities, with chains being the most common form of enrichment. When looking at finishing facilities, the adoption of enrichment was higher than in nursery,

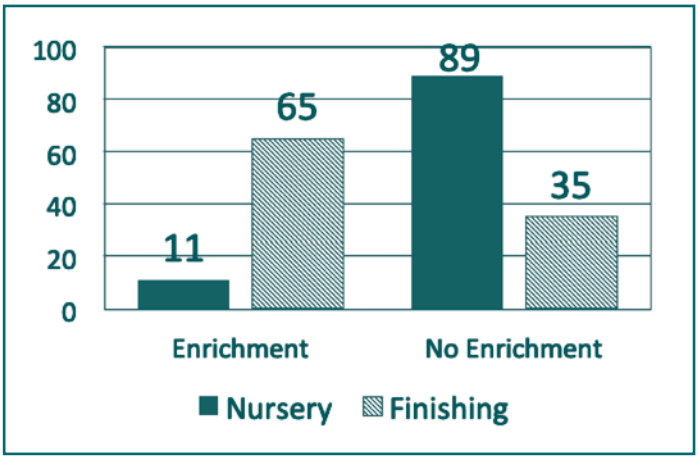


Figure 1. Estimated rates of on-farm adoption of enrichment on pork production facilities across Canada

with 65% of farms using some type of enrichment in finisher barns. Chains were again the most common form of enrichment (70 %) followed by wood (30 %).

According to the Code of Practice for the Care and Handling of Pigs (NFACC, 2014) pigs must be provided with multiple forms of enrichment that aim to improve the welfare of the animals through the enhancement of their physical and social environments. The incorporation of enrichment into individual facilities is unique to each operation. Support tools regarding enrichment materials are available in Appendix H of the Code, with different types of enrichment grouped into categories along with the advantages and disadvantages of each type.
The Six Ss - Simple Criteria for Choosing Enrichment for Pigs As outlined in Appendix H (page 54) of the Code of Practice there are six criteria to consider when choosing enrichment for your operation. Considerations could include the follows aspects: SIMPLE, SAFE, SANITARY, SITE, SOFT, & SUSPENDED. Figure 2 (below) provides more detail for each of these considerations.

Cost of Enrichment

There are several options available for producers to enrich the environment of pigs, some being more expensive than other options. However, reusing materials or objects already available on the farm can help to keep costs in check and maintain their effectiveness. It is important to hold pigs' interest, and this means changing the enrichment items on a regular basis.
Like anything else, we always have a choice on how much we decide to spend on any given investment. This is no different when it comes to deciding on our choice of enrichment. Lets take the example of installing a chain, with cotton rope attached, in a finishing room containing 12 pens, 260 pigs, and a 16-week finishing period. Based on the assumptions listed below producers would assume a one time annualized cost of $.65/hog marketed.

Installation Cost
- Chain, mounting hardware - $40/pen
- Labour (3 hours, $25/hour, 12 pens) - $6.25/pen
- Total - $46.25/pen or $555/room

Room Throughput
- 260 pigs/room
- 3.25 turns/year (based on 16 week finishing)
- 845 pigs/year

One time annualized cost = $0.65/pig

What happens if we take another approach to assessing this economic value? Assume that a market hog is worth $170. To achieve payback on our enrichment investment of $0.65/pig would represent 3.26 pigs ($555 / $170) or 0.4% (3.26 / 845) of the hogs marketed through that room annually. In other words we would need to find this value in order to make installation of enrichment economically worthwhile.

The benefits could be seen in a number of ways, perhaps we have less tail-biting and subsequently see a reduction in the number of mortalities, condemnations, or even amount of trim deducted at the packing plant. The point being, it takes only a very small change in these figures to see a positive economic benefit from enrichment. And if we assume that the benefits accrue over a four-year period rather than in a single year - installing enrichment looks even more economically viable, as we only need to find full value for one pig per year. Which seems easy to do given the wealth of research showing benefits of enrichment.

The Six Ss: Simple Criteria for Choosing Enrichment for Pigs

The Six Ss (41)[1]

SAFE
- No sharp edges
- No tires
- No poisonous wood or wood that may have been preserved, or ant other toxic material
- No staples of fixings in wood
- No materials that may be toxic to pigs
- Limbs or other body parts cannot become trapped
- if the enrichment can be broken or dismantled by the animals, the fragments must not pose a safety risk
- The enrichment should not be able to be used to injure pen-mates or damage the enclosure

SANITARY
- Materials should not be fouled
- Materials should be easily cleaned or sterilized to prevent disease transmission

SOFT
- For pig to slowly destroy the object, it must be malleable (adds to the novelty factor)

SIMPLE
- Anything too complex can cause frustration and could lead to vice
- A number of simple items is better that one complex item, and allows more pigs to gain access at one time

SITE
- Do not site toys over lying, drinking or feeding areas
- Dunging areas prove to be the optimum position
- Switch sites regularly to help maintain novelty

SUSPENDED
- Provides extended novelty factor
- Avoids fouling
- Allows more pigs to gain access to the toy it it is suspended in a central location

All enrichment objects must meet requirements contained in *National Swine Farm-Level Biosecurity Standard*, and the section on Biosecurity in QOA® for Canadian Hog Producers, Reders to AppendixO — *Resources for Further Information.*

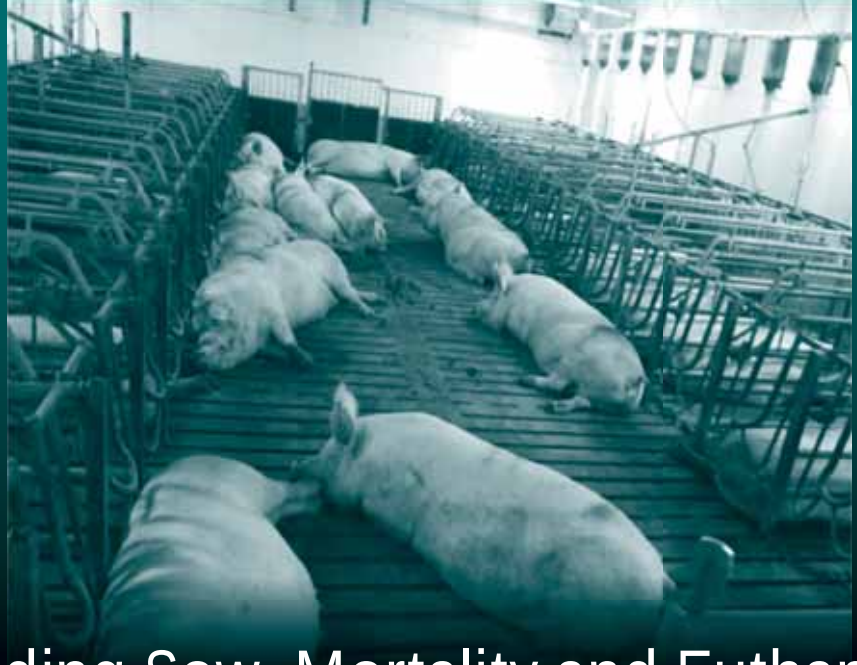
1 *Adapted from Environment Enrichment for Pigs – Providing objects or substrates for proper investigation and manipulation - keeping pigs occupied in non-harmful behaviour (refer to Cited References). Additional text from Guide for the care and Use of Agricultural Animals in research and teaching (refer to Cited References)*

CODE AND PRACTICE FOR THE CARE AND HANDLING OF PIGS - 2014

Figure 2. The Six Ss - Simple Criteria for Choosing Enrichment for Pigs

Conclusion

There is no denying that enrichment for pigs has been slow to catch on with pork producers. Besides the cost of materials and the time needed to install, clean or repair enrichments, producers may ask, "what's the big deal about pig toys?" However, there is now an impressive amount of research that providing enrichment to pigs results in benefits from reduced aggression, fewer damaging behaviors, and increased growth. We can also see that installing enrichment is an economically viable strategy for your operation.



Breeding Sow Mortality and Euthanasia

Serge Desrochers, P.T.,
Technical representative,
CIPQ inc.

For a long time, the mortality and euthanasia rate of breeding females recorded in a sow barn was around 5%. But since the arrival of more prolific animals, this average has doubled to almost 10%, or more in some herds. What are the causes?

PROLAPSE

Prolapse (collapse of the rectum, vagina and/or uterus) is the leading cause of increased mortality and euthanasia on a farm. In some operations, it is even responsible for up to 25 to 50% of deaths and euthanasia.

SERIOUS INJURIES AND LAMENESS

Serious injuries and lameness also lead to a significant number of euthanasia. It is true that lameness has always been occurring, mainly due to arthritis; so it is not a new phenomenon. Paradoxically, the adoption of animal welfare guidelines which lead to sows gestating in groups might cause some sows to experience more fighting and hierarchical competition. Euthanasia then becomes the only alternative to a sow unable to meet the requirements for transportation to the slaughterhouse.

This is why, in order to avoid causing trauma to animal limbs, facilities should be inspected regularly to ensure neither bolts, nor parts come out of the wall or the floor. The recommended gap widths between slats of flooring must be respected and well-designed floors should be kept as dry as possible, while ensuring that ventilation and heating are adequate at all times.

THERMAL STRESS

In the summertime, during lasting heat waves, some breeding sows die due to heat stress, a phenomenon observed more often in late gestation and at farrowing. Incidentally in Québec, the 2018 summer was particularly stressful. To get more details and recommendations regarding this phenomenon, please read the following article: Les canicules estivales (Summer heat waves), Le Courrier CIPQ, Volume 20, N° 1, April 2016.

GASTRIC ULCERS

In some herds, gastric ulcers may be common.
At an advanced stage, they are revealed by bleedings, a disturbed appetite and paleness of the skin and vulva, which is a sign of anemia. Eventually, the sow will die. Where do gastric ulcers come from? Grain size (granulometry), fibre content and the Vitamin E : Selenium ratio in the ingested feed might be the cause. If the problem persists for many sows, it is suggested to consult with the feed sales representative in order to investigate and make the required corrections.

TORSION OF THE STOMACH

A death caused by torsion of the stomach, liver and/or spleen is often provoked by overexcited animals intaking water and/or feed too quickly as a result of excessively long periods of deprivation. This is why, in order to prevent a break down in the feeding or watering system resulting in an extended deprivation, it is well advised to plan ahead and keep replacement parts on hand to resolve the issue as soon as possible.

RENAL INFECTIONS

Extended inadequate water intake and/or poor water quality, will lead to poor cleaning of the urinary tract. Thus, it will promote infections (e.g. cystitis = bladder inflammation / nephritis or pyelonephritis = kidney disease + urinary tract infection).

Usually, the first signs of an infection are expressed through very dark urine with a cloudy appearance. To get more details regarding recommendations, please read the following article: L'abreuvement (Watering), Le Courrier CIPQ, Volume 19, N° 3, October 2015.

It is also possible for urinary infections to occur as a result of a poorly cleaned environment, where the sows sit or lie down. So, a dirty floor can sometimes promote the entry of faecal bacteria through the urinary tract up to the bladder and the kidneys. Regular scraping is a simple measure that reduces the risk of possible infections.

> "Better understanding the causes of sow mortality can help producers effectively manage their operations. "

VARIOUS DISEASES

Of course, some diseases can have a devastating impact on a herd. We can think of Porcine Reproductive and Respiratory Syndrome (PRRS), or diarrhea like ileitis which, uncontrolled, will lead to death, mainly in gilts. Sometimes when an animal's immune system is already weakened, an episode of influenza or mycoplasma may cause death following pneumonia. Finally, even though they might only be isolated cases, we also encounter septicemia (blood infection) and metritis or endometritis (inflammation in the uterus).

DYSTOCIA

One can define dystocia as a difficult farrowing resulting from either a maternal anomaly or fetal anomaly. We often only think of the sow with large piglets who does not get assistance and dies from exhaustion after several hours of contractions. Mummified piglets spending many days in the uterus of the mother can cause septicemia and the death of the sow.
How to calculate costs associated with the death of a sow?
The cost of a dead sow depends on when her death occurs. The later the death occurs in the gestation period, the greater the loss of money will be as the sow has been fed and housed for several days, without being able to benefit from the sale of piglets. This loss of money cannot be recovered since, like the dead piglets, the carcass will not bring back any income. Incidentally, a premature death in the herd has to be considered since it modifies statistics by increasing the average non-productive days of the herd. To this already long list of losses, labour costs have to be added for euthanasia if necessary, removal from the pen and building, transport to the rendering facility, the rendering costs and finally the cost of a replacement gilt. It is therefore undeniable that premature mortalities are very detrimental to the net income of a swine business.

Conclusion

Animal mortality and euthanasia on the farm will certainly always be part of the reality of the swine business.

However, it is also true that the negative impact of this reality can be reduced by maintaining a diligent and thorough surveillance.

It is worth reminding swine producers that regular and watchful monitoring rounds can turn what may seem like a waste of time into a profitable investment.

Translated by Canadian Centre for Swine Improvement with permission from CIPQ. The original article in French is available at http://www.cipq.com/documents/_LeCourrier_automne2019.pdf

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Managing Water Intake

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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.

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) water disappearance 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 anywater disappearance above the rate of 7 L/day could be avoided. Therefore, the daily water disappearance would increase by 70% (or 30,800 L) to reach a total disappearance of 72,800 L/day. The direct cost of water wastage (30,800 L) associated with manure disposal would translate into approximately $119/day or $41,500 per year if the previous assumptions were met.

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]

Assumptions

- 6,000 head finishing barn
- Average daily water consumption per pig - 7L/day
- Duration of finishing period – 350 days/year (18 weeks/batch)
- 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.

Properly mounting nipple drinkers can help reduce water wastage.[3,4,5] Nipple drinkers mounted at 90° should be set to shoulder height, while nipple drinkers mounted at 45° 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.

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	1,7560	3,260	655
Daily Water Disappearance /Pig (L/pig)	7	7	14	19.25
Total Daily Water Disappearance/Day (L)	2,268	12,323	45,646	12,613
Daily Water Wastage (L/pig)	0	0	7	12.25
Total Daily Water Wastage (L)	0	0	22,823	8,026

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

Category	L/Day
Calculated Water Disappearance	72,849
Target Water Disappearance	42,000
Water Wastage	30,849
Additional Manure Disposal Cost/Day	$119

> "Regularly check water flow rates, it will determine time spent at the nipple, water intake and water wastage."

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 help reduce water waste to the same level as bowl drinkers.[1,3] 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 fromNipple 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/

Personal Profile

Michael Wellington

Michael Wellington is a postdoctoral research fellow at the Prairie Swine Centre/University of Saskatchewan, Canada working with Dr. Daniel Columbus. Michael grew up in Accra, Ghana and completed his undergraduate degree (BSc. Agriculture) at the University of Ghana and his master's degree (MSc. Animal Sci.) at the University of Copenhagen/Swedish University of Agricultural sciences under the Erasmus Mundus Food of Life programme. Michael recently completed his PhD in Swine nutrition and gut health at the University of Saskatchewan/ Prairie Swine Centre Inc., where he studied the interactive effect of feeding high fibre diets and immune challenge on threonine requirement in growing pigs and how these factors affect intestinal barrier function in growing pigs. Michael's postdoctoral research will be focused on investigating the effect of birth-weight (low or high) and early postnatal nutrition (normal nutrition or undernutrition) on piglet growth and development by evaluating proteomic and metabolomic pathway changes, and to further validate the piglet as a model in low birth weight infant (human) health research.

Coming Events

Alberta Pork Congress
June 9-11, 2020
Red Deer, Alberta

Ontario Pork Congress
June 17-18, 2020
Stratford, Ontario

Alberta Livestock Expo
October 9-10, 2019
Lethbridge, Alberta

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Currently scheduled dates and events are tentative at this time.

PRAIRIE SWINE CENTRE

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