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PRAIRIE SWINE CENTRE

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Finding Balance: What is good for the animals is good for production

Barn Insights Series – Practical Solutions to Group Sow Housing (Part 1)

Jen-Yun Chou, Ph.D.
Research Scientist,
Ethology
Prairi Swine Centre

When I walked into Egli's sow barn, located in Blythe, Ontario, the first thing I noticed is not the sows themselves, but the fresh air and tranquillity – no frantic bar-banging, no restless pacing – just relaxed animals rooting straw or stretching their noses into the hay bailage. For Marcel, who manages about 300 sows in a group housing system, this calmness is the proof that the extra work is worth it.

A conventional pig producer about more than 20 years ago, Marcel transitioned to group housing in 1996 and later switched to organic production. Now they have been receiving Global Animal Partnership certification for three years and supplying to a large processor in Quebec.

Individual Access Stalls: Choice & Shared Space

The barn is divided into four groups of about 70 sows, each on a five-and-a-half-week batch cycle. Pregnant sows have access to individual feeding stalls, but also a large common area bedded with straw (28 ft2 of straw space/sow). This allows each sow to eat in peace, while still providing freedom to move, lie, and socialize.

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Does providing high vitamin diets in gestation improve performance and passive immunity?

Hannah Burlet[1]
Frederic Beaudoin[2]
Beatrice Sauve[3]
Laetitia Cloutier[3]
Matheus de Olivieria Costa[1, 4]
Danyel Bueno Dalto[2]

[1] Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine, University of Saskatchewan

[2] Sherbrooke Research and Development Centre, Agricuture and Agrifood Canada

[3] Centre de Développement du Porc du Québec inc.,

[4] Department of Population Health, Faculty of Veterinary Medicine, Utrecht University

Introduction

The importance of vitamin supplementation in preventing deficiencies is well understood and widely accepted. Therefore the provision of vitamins in livestock diets reduces production losses due to performance issues. Increased vitamin supplementation has been reported to enhance immune response to maternal vaccination, supporting the passage of maternal immunoglobulins, better protecting neonates from disease. In addition, increased vitamin supplementation can enhance reproductive performance. In an industry facing challenges related to sow performance and piglet survivability, the prospect of straightforward support coming from an existing aspect of production is welcome.

Numerous studies have approached the influence of increasing a subset of vitamins during gestation on both performance and immune factors in sows and piglets. However, no published works have looked at increasing the concentrations of all vitamins normally included in vitamin premixes.

This study set out to examine if how a high vitamin diet, containing concentrations of all vitamins beyond industry standard, would perform relative to diets formulated to NRC (2012) recommendations, which are below what is generally fed. We assessed reproductive and piglet performance, and concentrations and titres of immunoglobulin G, an important factor to passive immunity.

> "Overall there were no consistent significant differences between control and high vitamin diets."

What did we do?

Initially, sixty-six dams (32 primiparous gilts and 34 multiparous sows) were selected (Centre de Développement du Porc du Québec inc. (CDPQ) maternity barn) and randomly assigned to a control (CTR) or high vitamin (HiVit) diet in equal numbers. They were followed over two consecutive reproductive cycles. Sows and gilts were housed in breeding stalls before being transferred to electric sow feeder (ESF) group gestational housing, and transferred into farrowing room approximately 5 days prior to farrowing. The CTR diet was formulated to NRC (2012) recommendations, while the HiVit diet was formulated beyond industry standard for vitamin supplementation (Table 1). Feeding of the experimental diets began after insemination, regarded as day 0 (D0) and halted on the day of farrowing (D113-117). Feed distribution and intake were controlled and recorded, and sows vaccinated according to the farm's health protocol. Cross-fostering occurred between parities within treatment groups.

Body weight and backfat thickness were measured on days 0, 80, 100, 110, at weaning, day 134-137. For analysis of antibody titres in response to vaccination, blood was collected from all dams on

days 0, 100, and 110 (collection occurred prior to vaccination on day 100). Colostrum was also collected, with samples being taken immediately before, after, or during farrowing; the first three pairs of teats were used for collection, avoiding underdeveloped or damaged teats. Litter characteristics were recorded over the course of lactation, with piglets being weighed on days 2 and 21 after birth. Blood was also collected from two average weight piglets from each litter on day 2 after birth, then from the same piglets on the day of weaning.

Our findings

Overall, there were no consistent significant differences between the CTR and HiVit diets in any measures assessed. Sow and gilt body conditions were not altered by allocated diet. In the first cycle HiVit sows weaned more piglets than CTR sows (P=0.039), though this difference was not seen in the second cycle, with HiVit sows tending to wean less piglets than their CTR counterparts (P=0.060). Gilts fed the control diet weaned fewer piglets than HiVit gilts in both cycles (P=0.014), though they also had smaller litters after cross

fostering (P=0.047). Litter sizes before cross-fostering were not statistically different. In the second cycle, HiVit gilt litters on D2 post-farrowing were significantly heavier than CTR gilt litters in the same cycle and the litters of both groups in the first cycle, though litter sizes were not significantly different (P=0.037, treatment x cycle interaction). This weight difference was not carried through to weaning. Treatment did not alter sow litter weights at day 2 or 21.

Consistent differences based on treatment or treatment and cycle interaction did not influence total IgG concentrations in gilt or sow serum, colostrum, or piglet serum. The only difference related to treatment was seen in the first cycle, where CTR sows had higher total IgG concentrations in D100 serum compared to HiVit sow samples from the same day (P=0.040); this difference was also seen in CTR sow colostrum in the first cycle (P=0.012), though no difference between treatment groups was detected on D110. These differences were not detected in piglet serum, nor were they mirrored in specific IgG titres. Regarding specific IgG titres, HiVit gilts had higher serum titres at D100 in the first and second cycles compared to CTR gilt serum (P=0.038). This difference was not seen in D110 serum, colostrum, or associated piglet serum titres in either cycle. Diet did not influence sow specific IgG titres in serum, though HiVit sow colostrum tended to have higher titres in the second reproductive cycle compared to CTR samples where no difference was seen in the first cycle (P=0.062). This difference was not reflected in associated piglet serum samples.

Table 1. Vitamin premix composition

Diet Component	CTR diet	HiVit diet
Vitamin A (IU/kg)	4,000	15,000
Vitamin D (IU/kg)	800	** 2,800 **
Vitamin E (mg/kg)	40	135
Vitamin K (mg/kg)	0.5	5.0
Thiamine (mg/kg)	1	2.5
Riboflavin (mg/kg)	3.75	10.0
Niacin (mg/kg)	10	45
Pantothenic acid (mg/kg)	12	40
Pyridoxine (mg/kg)	1	5.5
Biotin (mg/kg)	0.2	0.8
Folic acid (mg/kg)	1.3	5.5
Vitamin B12 (ug/kg)	15	50
Vitamin C (mg/kg)	0	300
Choline (mg/kg)	1250	800
Copper (mg/kg) as CuSO4	25	25
Iron (mg/kg) as FeSO4	100	100
Iodine (mg/kg) as Ca (IO3)2	0.5	0.5
Manganese (mg/kg) as MnO	40	40
Selenium (mg/kg) as Na2SeO4	0.3	0.3
Zinc (mg/kg) as ZnO	120	120

** In the HiVit diet, the 2800 IU of vitamin D will consist of 800 UI of vitamin D3 and the necessary amount of HyD to supply the equivalent of 2000 IU.
Note. HiVit = high vitamin diet, CTR = control diet

(Does providing high vitamin ... cont'd on page 4)

(Does providing high vitamin ... cont'd on page 3)

What does this mean?

Though it has been reported that increased vitamin supplementation can enhance sow reproductive performance and passage of maternal immunity, the current study did not find consistent evidence that a high vitamin diet provides any advantage. While HiVit sows weaned more piglets in the first cycle, the inverse outcome was seen in the second cycle. Though HiVit gilts weaned more piglets than CTR gilts in both cycles, they also had more piglets added to their litters, which were initially the same size as CTR gilt litters. Initial live litter weight was higher for HiVit gilt litters in the second cycle, though this difference did not persist to weaning. The possible role of enhanced vitamin nutrition promoting piglet robustness as birth is promising.

Our immunological findings mirror our performance findings; differences were seen, but not consistently or in meaningful ways. In the first cycle, HiVit gilt serum collected on D100 displayed higher specific IgG titres than that of CTR gilts, suggesting an enhanced response to initial vaccination on D80 of gestation. This difference was not seen on D110, following the second dose given to gilts. There was also no difference detected in gilt colostrum samples or associated piglet serum samples. The same pattern was seen in the second reproductive cycle, with vaccine administration only occurring on D100 following blood collection. The assay used to determine specific IgG titres utilized antigens from pathogens that dams may have been exposed to, but not fallen sick from, so it must be stated that there is cross-over with circulating antibodies not associated with vaccination. Additionally, no differences were detected in gilt colostrum samples or associated piglet samples. For sow samples, specific IgG titres were not different in serum samples at any time point, but HiVit sow colostrum tended to increase in the second cycle, with a treatment and cycle interaction. Ultimately, this increase in colostral titres was not translated into piglet serum.

The Bottom Line

In this context, vitamin supplementation beyond industry standard did not provide any consistent advantage over supplementation at NRC 2012 standards, which are below what is normally fed. Ultimately, the findings of the current study indicate that current industry practices for gestational vitamin supplementation are sufficient, but that further research into vitamin supplementation in swine production is needed to optimize costs and production value. Extended studies on the impact of increased vitamin supplementation through both gestation and lactation could provide relevant findings, especially if considering precision feeding systems.

Acknowledgements

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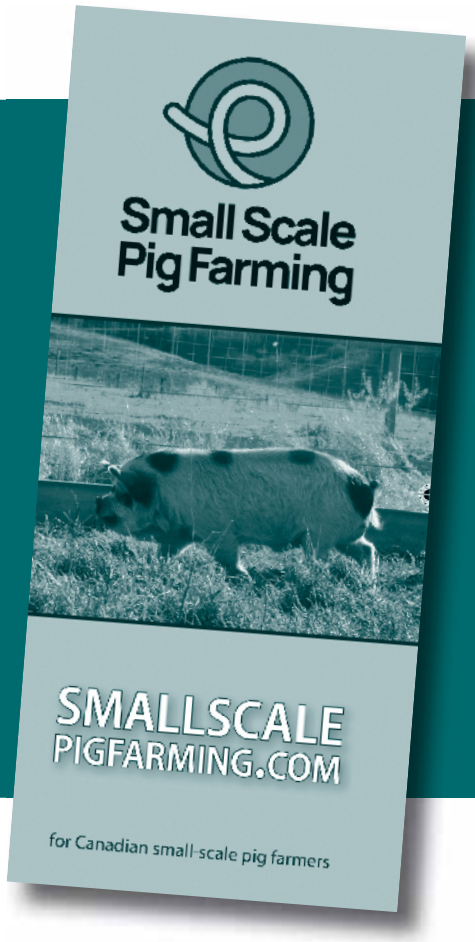
Over the past number of years Prairie Swine Centre has been successful securing funding (African Swine Fever Preparedness) to develop extension materials for small-scale pig producers throughout Canada. This project benefits the commercial pork industry by increasing engagement with this sector, reducing the ASF risk for Canada.



(Finding Balance...cont'd from page 1)

"I like feeding them individually in the mornings," said Marcel, "because I can see right away who's not eating. And I like to see they need their own space, because there are sows that eat really fast and other sows are nibblers… I have much more consistent control."

> "I feel good when I look at the sows and the sows feel good."
> -- Marcel Egli

Feeding is done four times a day. Each sow receives a base ration, then Marcel walks through with a cart to top up animals that need more. Marcel is also trying to feed his sows hay bailage which provides high fibre, gut fill, and an additional form enrichment. "We're supposed to eat our vegetables… They are omnivorous like us." Working with his veterinarian, they are recording and closely monitoring the sows' body condition scores to evaluate if feeding sows hay bailage can reduce the amount of concentrate feed, which can in turn reduce cost. The barn relies on natural ventilation, with limited fan use to keep noise low. Straw bedding plays a critical role in winter comfort.

Managing Workload

Batch farrowing is a conscious choice. All sows in a group farrow, wean, and move together. It means heavy weeks of work followed by quieter periods, a rhythm that suits the farm's size. "For 3,000 sows, this probably wouldn't work," he said. But in a 300-sow barn, the five-and-a-half-week cycle is manageable in terms of workloads and Marcel gets to take breaks to catch up on other farm work as he also runs his own crops operation. Cleaning and adding bedding are part of the added workload. Straw immediately behind the stalls are replaced monthly, while the rest of the straw pack is turned out only once every three months. "It is more labour [than crates]," he said, "but I feel like I get rewarded for it… I never have a sow in here that's doing [bar biting]. They don't need to do that because they're out. They have stuff to do. So I know it's the right thing to do."

Steady Performance

With Topigs genetics, litter sizes average 15–16 born alive and about 13 weaned. Fostering is used to balance litters, and creep feed is introduced early with small pellets before moving to larger feed. Weaned pigs are sold to his brother's grow-finish operation, also run under humane standards. Although no tail docking is practiced on Marcel's farm, tail biting is rarely an issue. His brother sometimes experienced minor tail biting in the nursery, but with good nursery management, it was never a major problem.

Lessons Learned

After nearly two decades with alternative housing, Marcel said the key ingredients for success are straightforward: sufficient space, adequate nutrition, right environment, and good people. He emphasized the importance of ample lying space, natural light, good air quality and understanding animal behaviour to ease handling. When asked about his relationship with his animals, he said "You do the best that you can. It gives me a lot of pride. When I see my sows and it's quiet, I'm happy to be in the barn. If I have an employee someday, I'd like to be able to keep that employee for 10 years because they want to be here." His barn is a reminder that group housing is more than a regulatory requirement: it's a practical and profitable working system that can deliver both animal welfare and farmer satisfaction.

Enrichments for phase of production

Miranda Smit, Ph.D., Ken Engele, BSA, P.Ag, Jen-Yun Chou, Ph.D.

Prairie Swine Centre

Environmental enrichment plays a different role as pigs grow and age. For example, enrichment for growing pigs focuses mainly on reduction of boredom and stress, improvement of performance, and prevention of damaging behaviours, whereas enrichment for gestating sows focuses mostly on alleviating hunger-related stereotypic behaviours. This affects the preferences for the types of enrichment in pigs of different ages. More information is provided on the enrichment preferences for each phase of production.

Sows around Farrowing Time

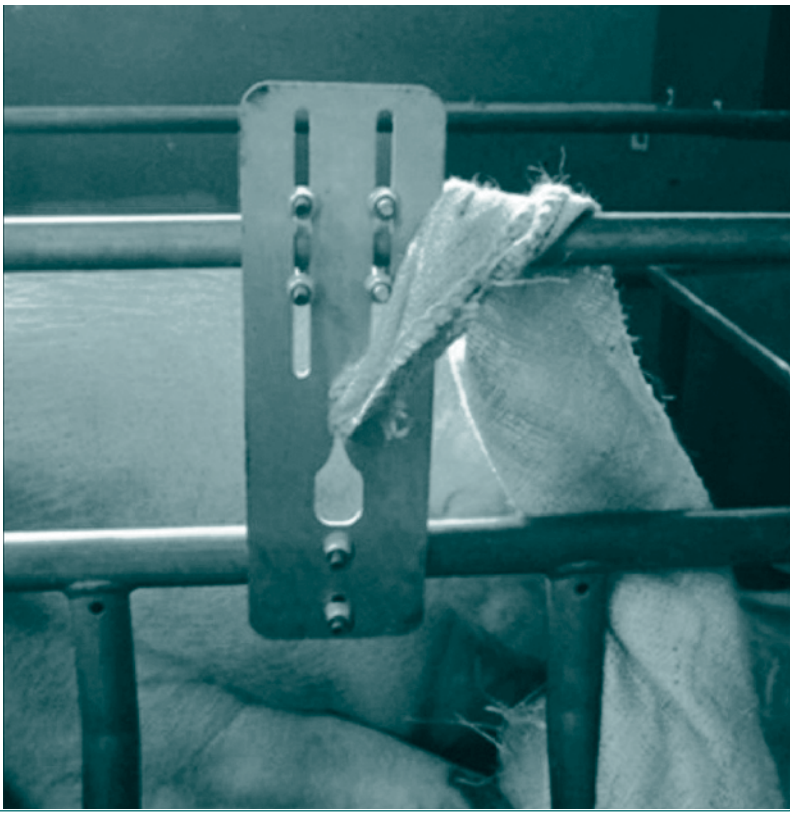
The day before farrowing, sows have an intrinsic need to perform nest-building behaviour. In farrowing crates, an elevated box of long straw, peat, or hay within reach of the sow can allow for some nest building. Sows provided with nesting materials have a smoother farrowing process including less stillborns, experience less stress, and show better maternal behaviours leading to lower piglet mortality and better piglet growth rate. It is also easier to observe which sows are going to farrow based on the use of nesting materials.

Overall Preference: straw, other substrates, burlap

Lactating Sows

Lactating sows can easily overheat, so straw is less suitable once farrowing is finished in the summer. Lactating sows also need to eat a lot, so additional edible enrichments are not ideal. Instead, items to manipulate to reduce boredom could be more suitable, such as a burlap sack or rope fixed to the crate within reach of the sow. Being able to have freedom of movement and unobstructed mother-offspring contact may be more biologically relevant during this time, but this requires a change in the layout design of farrowing crates.

Overall Preference: freedom of movement, extra space, burlap, rope



Piglets

Suitable enrichment material for piglets could be a small amount of easily chewable substrate. Piglets prefer malleable materials, such as rope and burlap. Commercial toys should be sized in such a way that piglets can take it in their mouth. On the other hand, the quantity or size of materials or objects needs to be large enough to allow multiple piglets to use it, similar to synchronized suckling bouts.

Providing loose substrates such as sawdust, shredded paper or chopped straw can help piglets with thermal regulation and drying off after birth.
Attaching cloths, ropes and tubes to a creep feeder stimulates piglets to explore the feeder, which may increase eating time post-weaning. Adding ingredients such as celery, breakfast cereals, peanuts, or black soldier fly larvae can increase piglet's pre-weaning feed intake, and adding sand as a rooting substrate inside the feeder will increase the time piglets spend exploring the feeder.

Social enrichment to piglets shows a lot of promise, such as co-mingling of different litters prior to weaning, or positive human interactions. Pre-weaning socialization can reduce aggression later in life, and positive human interaction pre-weaning makes pigs easier to handle throughout their lifetime.
Providing opportunities for piglets to play, through increased space allowance and a rotation of physical enrichments, improves disease resilience later in life.

An important note: Once enrichment has been given in the pre-weaning environment, it is important to continue to provide enrichment to pigs in pens thereafter. Moving a pig from a more to a lesser enriched environment can have negative consequences for the pig.

Overall Preference: straw, bedding, burlap, rope, shredded paper, positive human contact, extra space, social contact with other litters

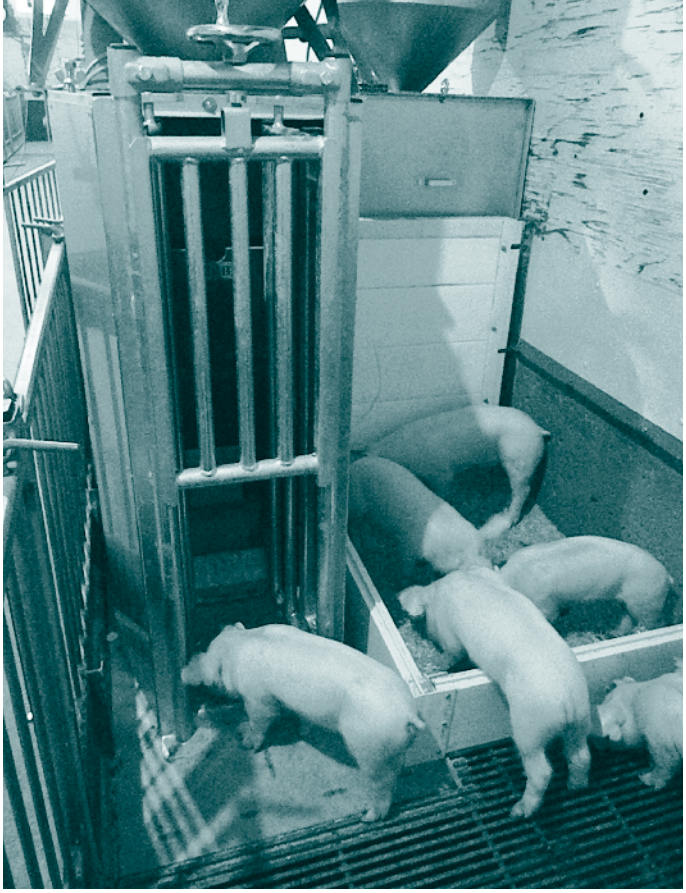
Nursery

Providing effective enrichment in the nursery is very important to prevent the onset of tail biting and to prevent later severe tail biting. It is especially important in the nursery phase to renew loose substrates or change enrichment items regularly to maintain interest. Enrichment should also be explorable by multiple pigs at the same time.

Straw, peat, wood shavings, and silage increase positive behaviours such as exploration and play. Corn silage might be a better option than straw for the manure handling system. Suspended objects are generally better than floor objects, except for rooting cones and a wooden beam standing vertically on the floor, which pigs spent more time with than suspended objects. Rope is the preferred suspended object, but it must be replaced often. Rope and burlap are preferred in strings versus knotted, though knotted versions last longer. When choosing commercial toys, PorkyPlay is preferred over BiteRite.

Sensory enrichment can be useful in nursery pigs. For example, garlic oil increases nursery pigs' interest in a cotton rope as compared to a non-scented rope, and scented newsprint increases the number and duration of interactions compared to unscented newsprint.

(Enrichments...cont'd on page 8)



(Enrichments...cont'd from page 7)

Overall Preference: straw, wood shavings, wood bark, burlap, rope, newspaper pieces, rubber hose, commercial toys, rubber mat.

Grower and Finisher

Due to limited space in the finisher phase, provide loose enrichment materials or multiple objects that are widely available and accessible throughout the pen. Straw is best, especially when provided in deep bed systems. Other types of bedding are also great for enrichment. Racks with enrichment such as straw, mushroom compost, silage, or grass work well in slatted floor systems, but they need to be accessible to not increase aggression. These racks provide a high level of engagement with the enrichment material and reduces skin lesions, tail biting and water wastage (due to less playing with the drinker). A rooting tower filled with organic material such as straw works to a lesser extent. Wooden logs hung from a chain and provision of newspaper sheets several times per week are options too. Simple objects like chains, balls and commercial toys should have supplemental enrichment that involves destructible or rooting materials.

Overall Preference: straw, bedding, fresh soft wood (birch wood is best), food enrichment (beet, grass, turnip), straw or mushroom compost in racks, rope, shredded paper, rubber, soft plastic, hard wood, PVC pipe, balls

Boars and Replacement Gilts

Breeding and teaser boars get released from their pen on a regular basis and experience human interaction and social contact with females, which can be a good type of enrichment. However, the rest of the time boars are housed in barren environments, often alone, so they need enrichment in their pen. Boars seem to have similar preferences as grow-finish pigs, with substrate bedding being the best option, and suspended cotton ropes being better than rubber chew sticks.
For gilts arriving newly to a farm, providing edible substrate can help them get used to the presence of humans. In addition, both boars and gilts are restrict-fed, so they may have similar challenges to gestating sows and potentially display redirected foraging behaviour (stereotypies). Recommendations for gestating sows may therefore also be useful for boars and replacement gilts.

Overall Preference: Straw bedding, straw in rack, positive human interaction, social contact with other pigs, hanging rope, rubber chew sticks, BiteRite, Tri-Star Standard Toy, hanging wood, smaller balls, PorkyPlay

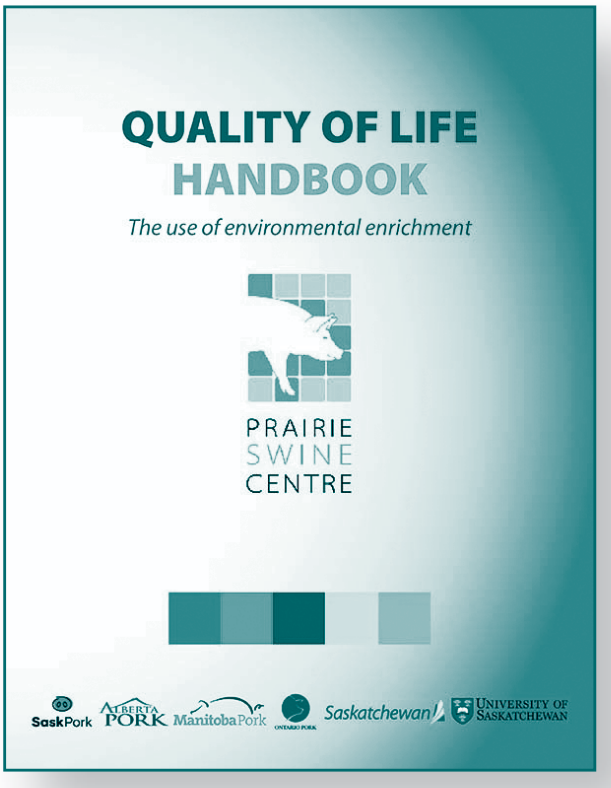
"Choosing the best enrichment for each phase of production can improve the quality of life for pigs."

Gestating Sows

Gestating sows are very feed motivated resulting in intense foraging behaviour. Without proper enrichment, stereotypic behaviour such as sham chewing may develop. Suitable enrichment for gestating sows includes feedstuffs and other edible enrichment, as well as objects that are chewable and destructible. Providing a variation of enrichment types can further stimulate sows to perform different repertoires in foraging behaviour. Due to dominance hierarchies in gestating sows, enrichment should be plentiful and accessible to all animals. Bedding such as straw is again the ideal enrichment. Racks with enrichment such as straw, mushroom compost or silage work in slatted floor systems, but they need to be accessible to not increase aggression. Sows usually prefer rope over wood or a chain. Simple objects like chains, balls and commercial toys should have supplemental enrichment that involves destructible or rooting materials.

Sow welfare was improved with a call feeder as cognitive enrichment. Cognitive enrichment should be researched more as an option for enrichment of gestating sows.

Overall Preference: Straw bedding, straw in rack, positive human interaction, EasyFix Astro, hanging rope, BiteRite, Tri-Star Standard Toy, hanging wood, smaller balls, PorkyPlay



The Quality of Life handbook is an excellent resource for producers looking to incorporate enrichment throughout their operation. It provides practical, cost effective strategies that will improve the pigs quality of life.

Influence of dietary nitrogen content and source to improve growth performance and lean gain in finisher pigs

Dan Columbus, Ph.D.
Prairie Swine Centre

The use of reduced-protein, essential amino acid (EAA)-supplemented diets have become commonplace to reduce feed costs and mitigate nitrogen (N) excretion into the environment. While growth performance can generally be maintained on these diets, there is some indication that reduced-protein diets may become limiting in either non-essential amino acids (NEAA) or N. It has been suggested that after meeting the requirements for the EAA, protein (or N) may become limiting, reducing the production of NEAA and limiting the utilization of EAA. For instance, Rocha et al. (2022) determined a minimum crude protein level required to maintain average daily gain in pigs, with 18.4%, 16.1%, and 11.6% estimated to be required for nursery, grower, and finisher pigs, respectively.

It has been suggested that dietary N sufficiency can be estimated through calculation of the EAA-N:total N ratio (E:T), with a higher ratio indicating potential N-deficiency and lower ratio indicating sufficient N. We have previously demonstrated that when an additional source of N, either as intact protein (Camire et al., 2023) or as non-protein nitrogen (NPN; Buchinski et al., 2024a) was included in N-deficient diets (as indicated by a high E:T), that N-retention was increased, resulting in a higher lysine requirement. Plasma AA analysis demonstrated an increase in EAA utilization (decreased plasma EAA) with NPN inclusion and increased plasma content of glutamine and glutamate (Buchinski et al., 2024a), which are important NEAA for N metabolism and non-waste utilization. We also showed that addition of NPN to diets did not alter pig growth rate, but improved feed efficiency, increased lean gain, and decreased fat gain in growing pigs (Buchinski et al., 2024b). The results of these studies suggest that it may be possible to replace some dietary protein/AA with a source of NPN to maintain growth performance, however, as these studies were based on grower pigs, the impact of dietary N content and source of finisher pigs is not known.

Improved feed efficiency while maintaining similar growth performance will result in reduced feed costs. In addition, use of ammonium phosphate as a nitrogen source has the potential to further reduce feed costs as its inclusion level is lower than intact protein to achieve the same E:T ratio with the added benefit of reducing or eliminating the need for additional sources of phosphorus.

What did we do?

A total of 270 mixed-sex finisher pigs with an initial body weight (BW) of 69.8 ± 0.37 kg were housed in groups of 5 pigs/pen and pens randomly assigned to 1 of 6 dietary treatments (n=9 pens/treatment). Dietary treatments consisted of an N-deficient diet (HR; E:T ratio of 0.33) or a low E:T ratio diet (E:T ratio of 0.30) achieved by supplementing intact protein (i.e., soybean meal; LRP) or NPN (i.e., ammonium phosphate; LRA). Each diet contained either a standard amount of Lys based on the requirement as indicated by NRC (2012) or Lys at 120% of the requirement (L), as indicated by our previous studies in pigs fed diets with a low E:T ratio. All diets were formulated to meet or exceed all other nutrient requirements according to NRC (2012), with diets analyzed for dry matter, crude protein, and amino acid content.

The experimental period was 42 d in length and pigs had ad libitum access to feed and water throughout the study. Individual BW and per pen feed intake were measured on d 0, 7, 14, 21, 28, 35, and 42 of the study for determination of average daily gain, average daily feed intake, and feed efficiency (gain:feed). On d 42 of the study, ultrasound was performed on 2 pigs per pen for determination of back fat and lean depth, all pigs were then weighed and shipped to a commercial abattoir (Thunder Creek)) for standard carcass measures.

RESULTS

Diet composition

Diets were analyzed to confirm nutrient content. Dietary protein and energy content were within the expected range of formulated values, however, amino acid content was lower than expected based on formulated values. Mixing inclusion of ingredients was confirmed to be accurate, so the lower values were either due to a systemic laboratory analysis issue or variability in ingredients. Results are discussed with the assumption that diets were made properly and contain the expected amount of nutrients, although there is a possibility that, in some cases, a lack of treatment effect may be due to lower amino acid content.

> "The E:T ratios of these studies does not appear to have a significant impact on growth performance of finisher pigs."

Growth Performance

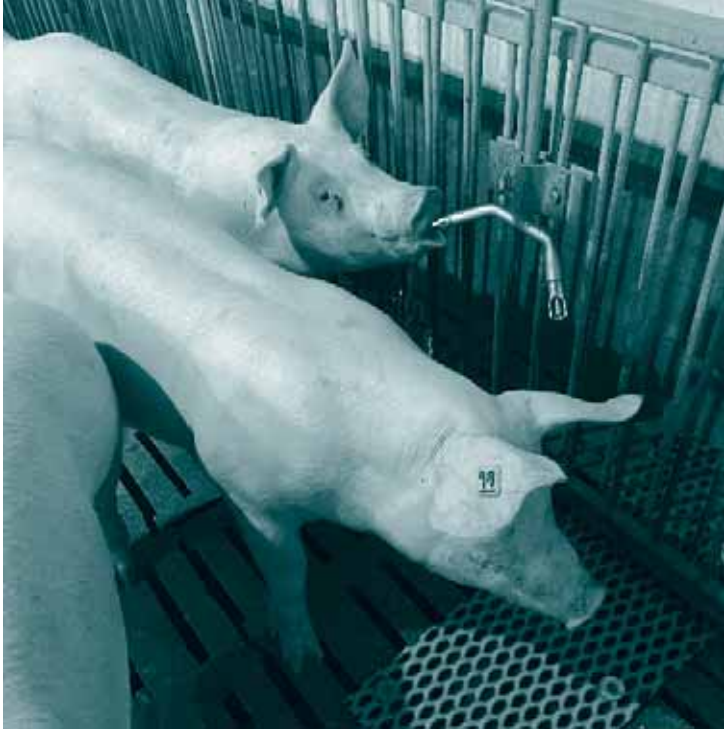
Overall dietary treatment did not influence body weight, except for a reduction in body weight of LRA-fed pigs on d 28 and 35 of the study compared to pigs fed HR, HR-L, and LRP-L ($P < 0.01$). Average daily gain between d21-28 was lower in LRA-fed pigs compared to HR-fed pigs from d 21-28 ($P < 0.05$) and compared to pigs fed HR-L over the entire experimental period (d 0-42; $P < 0.05$). However, dietary treatment did not impact IDG overall. There was no treatment effect on average daily feed intake. Feed efficiency (gain to feed ratio, G;F) was lower in HR-L pigs compared to LRP-fed pigs from d 0-7 ($P < 0.05$), and in LRA-fed pigs compared to HR-L, LRP-L, and LRP over the entire experimental period (d 0-42; $P < 0.01$). Gain:feed was reduced in LRA-fed pigs compared to HR-L from d 14-21 ($P < 0.05$).

Carcass characteristics

There was no effect of dietary treatment on body composition, lean depth, or backfat as determined by ultrasound ($P > 0.05$). Likewise, there were no dietary effects on carcass characteristics determined in market pigs, including carcass weight, yield, backfat, or lean depth ($P > 0.05$).

IMPLICATIONS

[Note: the following conclusions assume that diets contained essential amino acids at requirements/as formulated and the low analyzed values are due to an analytical issue]
The E:T ratios of these studies does not appear to have a significant impact on growth performance of finisher pigs. Dietary lysine had limited effect on growth performance, only having a positive effect in pigs fed diets with added ammonium phosphate (LRA). As there was no impact on feed efficiency, adding ammonium phosphate appears to cause a change (i.e., reduction) in nutrient utilization and the reduced performance does not appear to be due to a decrease in palatability. Overall, diet had no impact on final body weight or carcass composition, however, there was a decrease in average daily gain and feed efficiency with ammonium phosphate inclusion, indicating that producers may want to avoid ammonium phosphate in finisher pigs unless supplemental lysine is also included in the diet.



The differing results of E:T ratio and nitrogen supplementation in finisher pigs vs. grower pigs (Buchinski et al., 2024) may be due to a change in growth composition in finishers vs. growers, as finisher pigs have lower lean gain and reduced efficiency compared to growers.

Although not an original objective, this study also demonstrates that finisher pigs can grow well on diets containing as low as ~12% protein when essential amino acids are fed at requirement. An additional potential benefit shown in this study is that ammonium phosphate can also be a source of phosphorus, with inclusion of ammonium phosphate allowing for removal of other sources of phosphorus (e.g., monocalcium phosphate) from diet formulations. Finally, the results of this study show that there is no economic advantage to providing additional nitrogen or lysine in diets for finisher pigs as formulated in the completed experiment.

ACKNOWLEDGEMENTS

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Personal Profile

Atta Agyekum, Ph.D.

Originally from Ghana, Atta earned a bachelor's degree in agriculture from the Kwame Nkrumah University of Science and Technology before moving to Canada to pursue both his master's and Ph.D. degrees in Animal Science at the University of Manitoba, studying under Dr. Martin Nyachoti. His Master's research focused on growing pig responses to diets containing distiller's dried grains with solubles (DDGS) supplemented with a multicarbohydrase enzyme. His doctoral research focused on understanding the nutritional and metabolic effects of feeding growing pigs a high-fibre diet supplemented with feed enzymes. Following his graduate training, Atta moved to the Prairie Swine Centre in 2016 to pursue postdoctoral research with Drs. Columbus and Beaulieu, where he investigated the potential of processed straw to enhance the welfare and reproductive performance of pregnant sows in a loose housing system and the benefits on their offspring's lifetime performance. He then worked as a Research Associate with Dr. Andrew Van Kessel on the Pig Gut Microbiome project at the University of Saskatchewan. In 2020, Atta was appointed as an Assistant Professor at the University of Copenhagen in Denmark. He was the principal investigator on a research project with a world-renowned feed additive company to investigate grapefruit extracts as a safer alternative feed additive to ractopamine for stimulating muscle tissue growth in fattening pigs. He was also a co-PI on a Danish pig levy fund to investigate the biological basis of feed efficiency in fattening pigs. Atta returned to Canada in 2022 to join Trouw Nutrition Canada as the Swine Validation Research Lead on several Local and Global projects. In July 2025, Atta took on the role of Research Scientist at the Prairie Swine Centre, where he leads the Nutrition Research Program. His research priorities include: 1) developing nutritional strategies to enhance pig resilience against environmental and management stressors; 2) improving nutrient use and efficiency in swine; and 3) evaluating alternative feed resources and quantifying their nutrients to maximize their use in pig feed.

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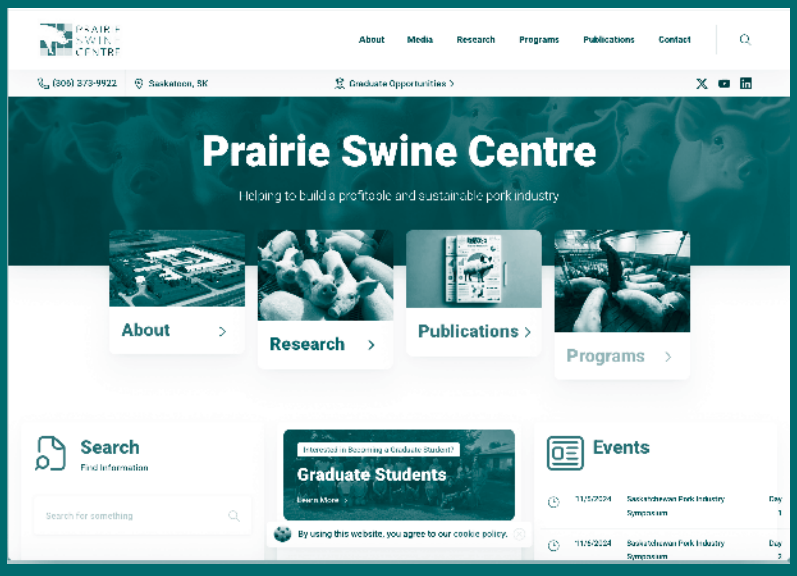

Coming Events

Banff Pork Seminar
January 6 @ 4:00 pm – January 8, 2026
Banff, Alberta

Manitoba Swine Seminar
February 4 @ 9:00 am – February 5, 2026
Winnipeg, Manitoba

Saskatchewan Livestock Expo
February 19, 2026
Swift Current, Saskatchewan

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Prairie Swine Centre Inc.
P.O. Box 21057, 2105 - 8th St. E.
Saskatoon, SK S7H 5N9 Canada

Tel:(306) 373-9922
Fax:(306) 955-2510
www.prairieswine.com

Prairie Swine Centre is an affiliate of University of Saskatchewan