centred on

SWiNE

In This Edition

Fall 2013 Volume 19, Number 1

Program funding provided by

Sask Pork

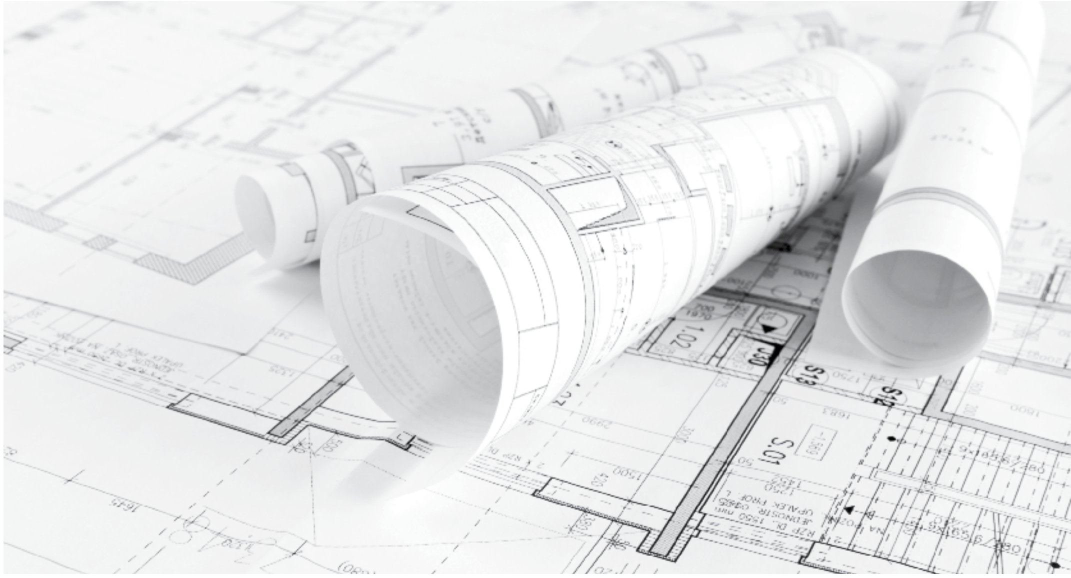
Manitoba Pork

Alberta Pork

Ontario Pork

Saskatchewan Ministry of Agriculture

Rebuilding an Industry



Lee Whittington
B.Sc., MBA, P.Ag.
President/CEO
Prairie Swine Centre

When is the right time to talk about rebuilding? The weather in North America is front page news every week highlighting natural disasters, add in the pipeline spills, man-made flood diversions and train derailments and there is a large selection of examples of disasters that have beset people in the past year. But it is the reaction of people to those disasters which is most telling. A variety of challenges large and small - yet the response from those people affected is consistent – rebuild.

The pork industry has endured a series of challenges that total nothing short of a disaster without doubt, and the outcome is evident with a 20%+ decline in sow numbers in Canada since 2005. The challenges just kept coming for eight years – circo virus, avian/swine influenza, dollar exchange, feed costs, ethanol policy, COOL…each new season brought a new blow to our industry. So what should we do? – rebuild.

Rebuilding the Canadian pork industry doesn't necessarily mean new barns, it starts first with rebuilding our attitude about our business, reengaging employees in a discussion about their careers, informing financial institutions and governments about what redevelopment will mean.

(Rebuilding an Industry ... continued on page 5)

Publication # 40010021

Minimizing & Managing Ingredients Variability


Denise Beaulieu, Ph.D. & Ken Engele, BSA
Prairie Swine Centre

An understanding of potential causes, implications and solutions to variation in nutrient composition of ingredients used for livestock feeds is essential for efficient pork production. It is relatively easy to calculate profit lost due to paying for nutrients not present or alternatively, not receiving full value for nutrients paid for. Costs however, are also associated with inefficient utilization of nutrients due to over-formulation, or growth and even health consequences due to under-formulation. The common practise of formulating diets with a safety margin to account for potential variation in nutrient content of ingredients adds cost to the final ration.

Feed manufacturers are expected to produce consistent diets from inconsistent ingredients. Increasing use of by-products, narrowing of margins or even losses and precision feeding technology requires a more thorough understanding of the nutrient content of ingredients.

Minimizing consequences of ingredient variability

Basic statistics informs us that 50% of the corn or wheat we purchase contains less than the average content of energy, lysine, Ca or any other nutrient. The decision to allocate resources to minimize the effects of ingredient variation assumes that 1) variation exists in nutrient content of the ingredients and 2) there are consequences to this variation which warrant the proposed expenditures.

Energy is the most expensive nutrient in swine production. Cost of the variation in NE content can be estimated by assigning a monetary value to the energy (ie. dollars per Mcal) and calculating the cost difference assuming the grain was purchased at a constant price, regardless of the energy content. An example, using the variation in the cost of DE is shown in Table 1. The potential difference in the cost of a Mcal, using current ingredient prices ranges from $ 0.01 for corn, corn DDGS and wheat to $0.03 per Mcal for field peas. While this doesn't seem like a lot; assuming that pigs require 735 Mcal DE to grow from 35 to 120 kg BW (Beaulieu et al. 2009) and the variable DE grain contributes 50% of this energy, a difference of only $0.01 per Mcal would result in a difference of $3.70 per pig.

Table 1. Cost per Mcal of ingredient and the opportunity cost associated with variable energy content.

Ingredient	$ / tonne[1]	DE, mcal/kg	$ / Mcal DE	Opportunity cost ($ per 370 Mcal)[2]	Reference[3]
Corn	360	Min 3.78	0.09		
		Max 4.03	0.10	3.70	NRC 2012
Corn DDGS	372	Min 3.87	0.09		
		Max 4.24	0.10	3.70	NRC 2012
Wheat	293	Min 3.70	0.07		
		Max 4.05	0.08	3.70	Zijlstra et al. 1999
Barley	257	Min 3.12	0.06		
		Max 4.29	0.08	7.40	NRC 2012
Field peas	257	Min 3.109	0.08		
		Max 4.56	0.11	11.10	Leterme et al. 2008

[1] *Saskatchewan, Canada 2012.*
[2] *Difference between the minimum and maximum and assuming the grain contributes 50 % of the 735 Mcal required in grow finish (35 to 120 kg BW; Beaulieu et al. 2009).*
[3] *Reference of the DE minimum and maximum values (insufficient data to use NE).*

Potential cost of ingredient variation in nutrient content increases with the cost of ingredients. Data in Table 2 was generated using the Prairie Swine Centre/George Morris Centre enterprise model in order to calculate overall changes in feed cost per pig assuming barley was purchased at a constant price despite varying DE content. The data for diet formulation and expected changes in performance due to changes in DE content of the diet were derived from Beaulieu et al. (2009). Even with relatively low feed costs (2006) the difference was almost $3.00 per pig. 2012 prices, however, the difference was over $5.00 per pig.

Table 2. Difference in overall feed cost per pig if purchased barley with a low or high DE content with various feed cost scenarios.

	Variation in barley DE		
Feed Cost/pig	Low DE barley	High DE barley	Difference
$ 109.16 (2012)	$ -2.92	$ 2.59	$ 5.51
$ 85.44 (2011)	$-2.20	$ 1.96	$ 4.16
$ 65.98 (2006)	$-1.56	$ 1.39	$ 2.95

The above examples in Table 2 assume that a swine producer has purchased an ingredient or a diet based upon an assumed energy content, and received a diet with energy content lower than average, and in fact low enough to affect performance. Calculations and discussion above are focused on purchasing an ingredient which has an energy content below average or on the "left side" of the standard curve. In these examples, the "buyer" of the ingredient or diet is assuming the risk. A example of "risk versus rewards" including the perception of risk and ingredient diversification decisions is found in Figure 1 using mycotoxin contamination as an example.

Variation in ingredient quality, whether due to mycotoxin contamination (Figure 1), or reduced nutrient content produces two types of error associated with purchasing or selling these ingredients. If a good lot is rejected or a lot with a concentration less than the legal limit mycotoxin, or above average nutrient content) or priced below actual value then the seller is accepting the risk as they have lost potential income. Conversely if a bad lot is accepted and sold, the buyer is accepting the risk as contaminated feed may be incorporated into a diet or performance will not reach that predicted by the diet formulation. The limit assumes that there will be a difference in animal performance between animals fed diets based on a "good" or "bad" lot.

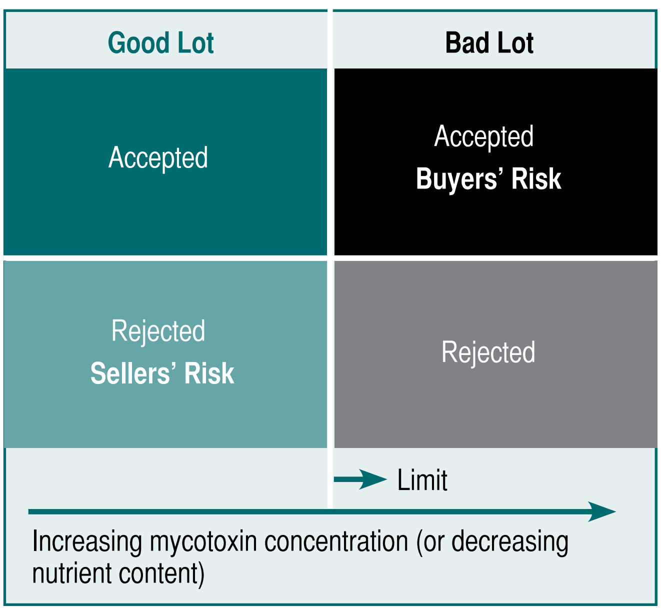


Figure 1. Risk assumed by sellers or buyers based on error. Source. Patience et. Al 2009

Reducing risk associated with ingredient variability by increased sampling and analyses (or can I use book values?)

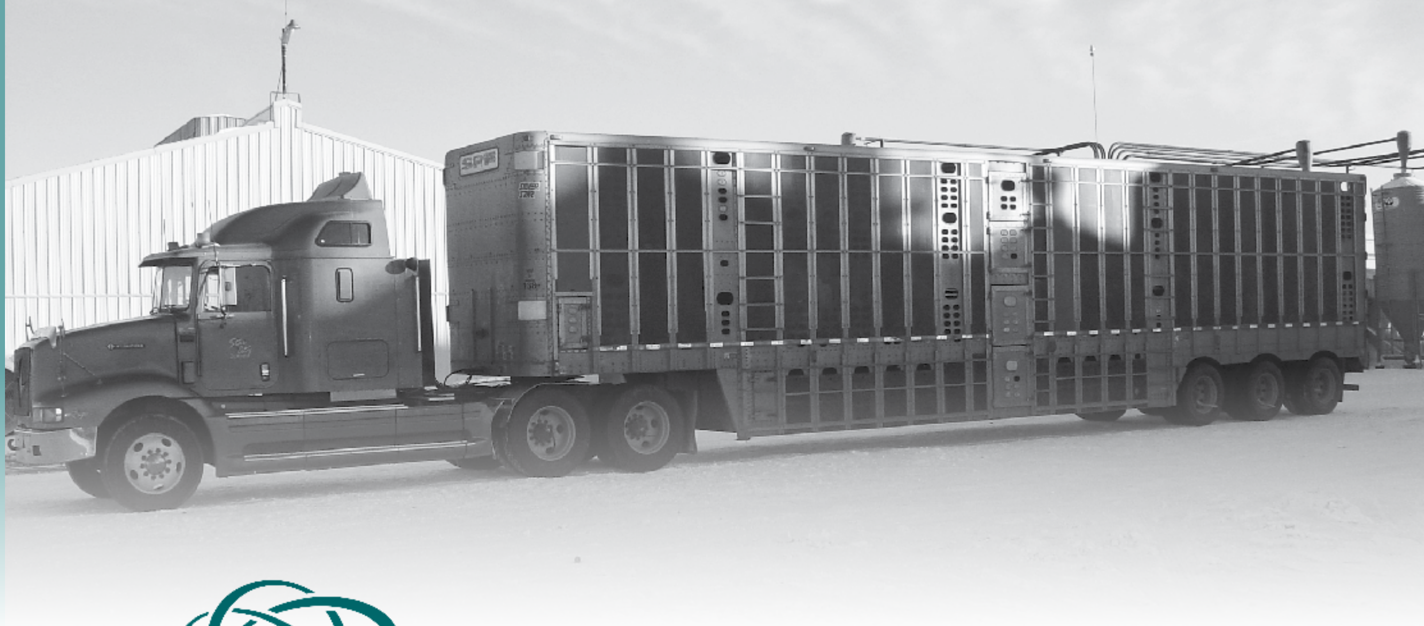
It is intuitive that if one can accurately characterize nutrient content of ingredients the risks associated with their utilization is reduced, especially for the buyers. Ingredient variation may be due to real differences among the grains purchased, and it may also be an artefact of biases and inaccuracies in the sampling, sample preparation and analyses. Removing these sources of variation through improved sampling techniques to ensure that the sample accurately represents the load, and reducing in-lab and between lab sources of error can reduce this source of variation. These all have a cost associated with them, which must be assumed by buyers, sellers or both. Various industries (ie. corn DDGS) have recognized the importance of standardizing analysis of ingredients and by-products and the benefits to the entire industry. Statistical tools exist to aid in the development of sampling plans based on opportunity cost and risk (Whitaker et al. 2005). Increasing sample size or number and reporting an average result reduces risk to both buyer and seller. Conversely, when all samples are required to test above or equal (or below in the case of mycotoxins), the risk to the buyer is reduced, but the risk or cost to the seller is increased. This type of sampling plan is more common where the risk of accepting a bad lot is obvious and quantifiable.

An effective quality assurance program is a costly investment and questions must be asked regarding the proper allocation of resources. However, once properly established, the databases obtained allow important historical perspectives to be used and aid in the decision making process. This is analogous to the costly variation faced by livestock producers in terms of animal growth and as discussed by Patience and Beaulieu (2006) it is important to recognize within each facility what is normal variation which must be accepted and managed and when variation is a symptom of a problem which should be addressed. Consistent analysis of mixed diets leaving a mill will ensure standards are being met, and if a problem or errors exist in the production line. Frequent analysis and characterization of ingredients entering the mill can allow adjustments to ensure consistent mixed diet quality. Increases in ingredient variability above historical norms indicates a problem. Identification of the source of the problem (lab? supplier?) could allow this variation to be addressed.

Analyses are expensive and can be a source of variation. Moreover, chemical analysis of an ingredient often provides little information regarding the utilization of nutrients by the animal. Examples, of course, are energy, amino acids and P which rely upon animal experimentation or statistical correlation techniques which allow digestibility or availability to be approximated based on chemical constituents. Many producers and nutritionists rely upon tables of nutrient composition for ingredient composition and while most of these tables now contain an estimate of the variation associated with each mean, the lack of information is obvious.

(Minimizing & Managing ... continued on page 11

Effectiveness of Sprinkling During Transport



Swine Innovation Porc

Louise Thériault and Ken Engele
on behalf of Swine Innovation Porc

Research funded by Swine Innovation Porc has found sprinkling pigs on-farm prior to transport, and just prior to unloading at the packing plant, improve pig comfort and meat quality when outside air temperatures exceed 20 °C. Results were generated from a pan-Canadian project conducted in summer 2011 by Luigi Faucitano, Centre for Research and Development of the Dairy and Swine Agriculture and Agri-Food Canada, Sherbrooke, Quebec.

It has been generally accepted high temperatures contribute to the mortality of pigs during transport, and sprinkling during transport effectively reduces the pig's body temperature. Currently there are no standard guidelines when to sprinkle pigs during summer months, rather truckers sprinkle the pigs when they feel it is "hot". This study, the first of its kind in North America, has been conducted to provide a clear procedure to follow for the transport of pigs to the slaughterhouse under summer conditions. To accomplish this, the efficacy of sprinkling was evaluated in a trailer in hot conditions on the welfare of pigs and meat quality, in addition to identifying the most suitable temperature for the maximum efficiency of the mist.

From June to mid-September 2011, nearly 5,000 market pigs were transported (for 2 hours) to slaughter in one of two pot belly trailers with a capacity of 208 hogs. Trailer #1 was equipped with a sprinkling system designed to sprinkle the pigs 5 minutes prior to departure at loading (on-farm), and 5 minutes before unloading at the slaughter plant in order to reduce the stress associated with loading and wait before unloading.

Spraying 125 liters of water for after at loading (on-farm) and just prior to unloading (at slaughterhouse) was effective in reducing stress associated with transport, and subsequently improving meat quality of pigs located in critical compartments - when outside air temperatures exceed 20 °C. Results were obtained by measuring blood lactate levels at slaughter and pH one hour after slaughter and drip loss in the loin muscle.

"At 20° C or more, sprinkling during transport is beneficial"

Negative heat

The upper limit of the thermoneutral zone of pigs during transport is 30 ° C. Above this temperature pigs must use various behavioral and physiological mechanisms to maintain constant body temperature. However, when conditions are extreme, these regulatory capacities may be insufficient to dissipate heat and it is at this point that death by hyperthermia may occur.

During summer, the temperature inside a pot-belly trailer can be hotter than the ambient outside temperature up to 6 ° C, especially in the lower compartments and those on the front of the middle deck. When these conditions exist it is beneficial to cool pigs through sprinkling, reducing body temperature in hot weather and improving the pig's well-being. The current guidelines for use of sprinkler systems are based on industry practices, and are inconsistent because some guidelines recommend watering pigs in a stationary vehicle at ambient temperatures of 15 ° C ,while other guidelines recommend sprinkling at 27 ° C.

During the experiment, the outside temperature ranged from 14.1 to 25.8 °C. Researchers collected additional data such as variations in temperature, relative humidity and ammonia levels in the trailers, in addition to the change in body temperature of pigs, stress and behavior of animals. The temperature of the pigs was recorded using temperature data loggers (iButton) which were orally administered. Several observations were made using video cameras in four compartments - one on the upper deck, two on the middle deck, and on the lower deck - tested each of the two semi-trailers.

What is a iButton?

The iButton is a digital thermometer connected to a computer chip enclosed in a stainless steel box. In this project, the iButtons were orally administered 12 hours before loading pigs and recordings were made from the gastrointestinal tract during the handling and transport.

Relax in a shower

Pigs transported in semi-trailer equipped with a sprinkling showed a lower blood lactate level than pigs transported with no sprinkling system. The lower lactate level indicates an improvement in their physical condition caused by reduced fatigue during slaughter. An hour after bleeding, the rate of acidification of the meat, as measured by the pH in the loin muscle is lower in pigs showered, indicating a pig less stressed and a better quality of meat.

Very few Canadian trucks are equipped with a sprinkling system because of uncertainty about its effectiveness and the lack of guidelines for its use. Recommendations generated from this project will make a difference as they are now included in the training program "Canadian Livestock Transport". Results led the researchers to conclude that sprinkling may help alleviate heat stress in transport, and without increasing slipping and falls during unloading.

Acknowledgements

The realization of this project was made possible through a financial contribution Swine Innovation Porc, its private partners and Agriculture and Agri-Food Canada.

(Rebuilding an Industry ... cont'd from page 1)

This article is built on the premise that things get better or worse but they do not stay the same. For the past 25 years we have grown accustomed to an industry with unlimited growth potential, a similar but shorter period took place in the mid-70's when we 'skipped a portion of the 4-year cycle' and hog prices rose when they traditionally should have declined, and it fueled an investment surge. I was in university at the time and we had classmates considering dropping out to join an expansion in the family business – some did, and successfully built careers from that moment of change.

1) Productivity in our barns across the country has never been better – or more consistent

2) Reinvestment on a large scale is starting to take place – think Shuanghui-Smithfield transaction and similar game changers with the companies we know in Canada

3) Grain prices are moving in the opposite direction to the past three years and stocks are projected to be catching up to increased useage growth.

4) World prices for pork are rising, some because of the latent effect of high feed prices, finally pushing pork prices, some driven by increased appetites and restricted availability to pork outside North America.

Of course not all change is pointing in the same direction. There are significant limitations to financial resources and some changes such as north-south trade in pigs and pork will not 'return to normal' in the short term. As a Research Centre serving the knowledge and technology needs of the industry we are rethinking – what do pork producers need now and in the next decade and how should we address that need? Some challenges that are being identified and will need to be addressed in our next 5-year business plan are listed below:

1) Welfare codes – with the added investment will it result in added income for producers and better welfare for pigs?

2) Barn age and condition – the 1990's building boom has reached a maintenance milestone, new investment and technologies are required to prepare these structures for the next twenty years.

3) Global growth and interdependence can result in new challenges like Porcine Epidemic Diarrhea (PED).

4) Avoid becoming complacent on diet costs – keep implementing those practices that helped us survive 2012-13.

5) The face of our labour force has changed – how are we contributing to a trained, safe and loyal workforce?

6) New investment in keeping cost of production low should be the priority. Given a dollar to spend where is the best investment? Do we have the tools and expertise to answer that confidently on a farm by farm basis?

7) Investment in new technologies for livestock production is under pressure. Why will companies invest in technology development for swine if current trends to protect markets (removal of ractopamine) and create new niches (example removal of antibiotics) seem to focus on what to "take out of pork production". This is an ominous trend to reject technology rather than making the most use of science to improve growth, efficiency and product quality.

It is our promise to you that we are and will be addressing these challenges and others. The Prairie Swine Centre downsized, economized and modified how it does business over the past five years as a result of the many external pressures on the industry. But through this change the Centre worked to maintain its unique mandate and mission. As we develop the next 5-year strategic plan for Prairie Swine Centre we will be seeking your insight and guidance on what the right questions are and how we should be addressing them.

The industry will rebuild – we are committed to looking for the opportunities. Our role is addressing the use of technology as producers redevelop their business models, providing the type of information governments and financial institutions need to re-engage with industry, and generating the breakthroughs that attract the attention of young people to seek careers as veterinarians, stockpeople, service people and researchers. This will take time.

Novel Biocontainment Concept for Quarantine Facilities

Canadian Swine Health Board Conseil canadien de la santé porcine

Valérie Dufour, M. Sc.,
Project Manager, Centre de développement du porc du Québec inc. (CDPQ)
Christopher Robitaille, Jr. Eng.,
R. Robitaille et Fils

The quarantine facility plays an important role to preserve a good health status in a farrowing barn. However, this swine building is often located within 100 meters of the breeding facility. Scientific studies have shown that the PRRS virus (PRRSv) can be transmitted through the air over 9.2 km. Having the quarantine building in the vicinity of the farrowing barn thus represents a high contamination risk if the animals in it happen to be PRRS-positive. In such a case, it becomes important to contain the viruses inside the quarantine building in order to protect the neighboring sow herd. Since it has already been shown that filters located at the air inlet are efficient to prevent PRRSv spread, then why not use them at the exhaust fan? The main issue in this design idea is obviously the high dust concentration in the swine building that would cause the filters to clog up rapidly, thus making their maintenance complicated and costly. In an effort to solve this problem, CDPQ, R. Robitaille et Fils and the Institut universitaire de cardiologie et de pneumologie de Québec (IUCPQ) Research Centre tested a novel biocontainment concept in a quarantine facility attached to a farrowing barn.

This simple concept consists of filtering the air at both the air inlet and the exhaust fans to contain the contaminated air while using an ionization system in order to reduce the dust concentration inside the building and thus the clogging rate of the filters. More precisely, the biocontainment system contains:

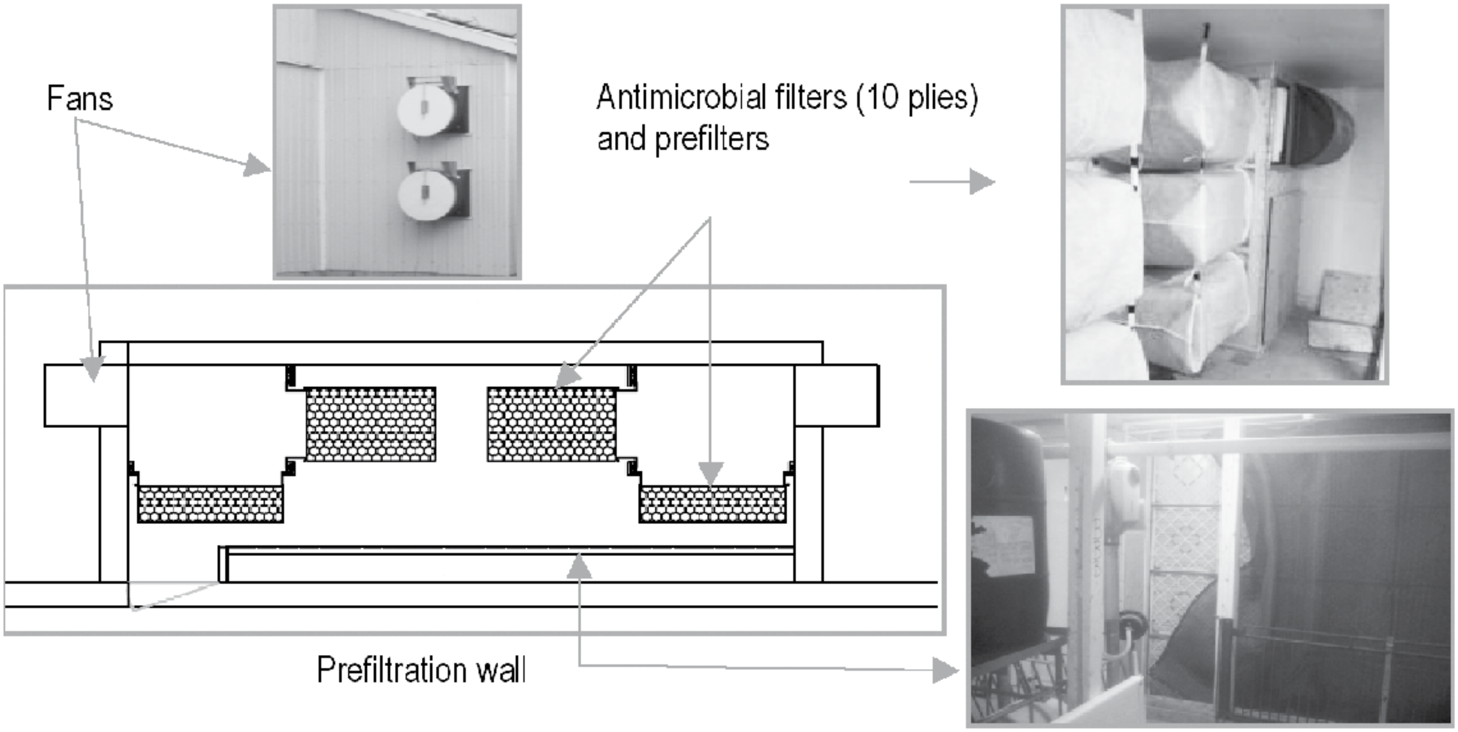
1. An ionization system consisting of:
   a) An electronic control generating a high voltage that ionizes the air through discharge lines and stainless steel spikes, thus producing negative ions (EPI Air®, Baumgartner Environics, MN, USA). The ionization process induces an electric charge on the dust particles and the grounded surroundings (walls, ceiling and equipment) behave as magnets that attract those particles. (See photo)

> "The potential economic impact of a PRRS outbreak to producers is estimated at $35-$140 per sow."

2. An air filtration system located in an air treatment room at the air exhaust consisting of:
   a) A prefiltration wall made with MERV 13 prefilters (Clarcor, IN, USA) at the air treatment room inlet that intercepts the majority of the particles remaining after the ionization process. This allows keeping the downstream antimicrobial filters clean for as long as possible, thus maximizing the efficiency of the antimicrobial agents within the filter fibres;
   b) Two filtration boxes provided with antimicrobial filters (Noveko, QC, Canada) made up of 10 plies of antimicrobial membrane along with their prefilter to mechanically block and chemically kill the viruses that may exit through the fans;

3. An air filtration system in the attic spaces consisting of:
   a) An antimicrobial filter made up of 15 plies of membrane and a prefilter (Noveko, QC, Canada) installed at each air inlet to avoid contaminated air backdraft to the environment that may contaminate the adjacent sow herd.

By itself, the ionization system was able to to significantly reduce the dust concentration (64%) and the total bacteria concentration (83%) in the building. The airborne particle reduction (sizes varying from 0.3 to 10 µm) due to the system is 60% on average and varies from 54 to 97% according to the size. The smallest reduction is for the 0.3 µm particles, those that are the most difficult to capture by filtration. It was found that these reductions remove the need for filter and prefilter maintenance and that the only necessary maintenance was in between the batches of gilts.



Installation and layout of antimicrobial and prefilters.

Therefore, the clogging rate of the filters with this concept is satisfactory. The necessary cleaning frequency during summer is currently not known but a tight monitoring of static pressures with a manometer will definitely be needed.

Globally, the implementation of this novel concept results in net savings of approximately $3,000 compared to a quarantine facility located 100 meters from the farrowing unit. Other savings could potentially be added to it (animal transportation, working time, etc.). However, whether the producer invests in this concept or not should primarily be driven by the PRRSv contamination risk that the gilts represent to the sow herd. The insertion of a health problem due to PRRS in a sow herd can lead to very important revenue losses ($35 to $140 per sow) (Klopfenstein et al., 2013). Moreover, the necessity to filter the air at the outlet of the quarantine facility, typically located within 100 meters of the farrowing barn, should be further analyzed with regards to PRRS airborne transmission. Such filtration necessity would economically support the need to build the quarantine facility and the farrowing barn in the same building.

This biocontainment concept met all expectations in terms of clogging rate during fall but further tests should be conducted during summer to assess whether or not the prefilters should be replaced during the quarantine cycle due to the higher airflow rates. It would also be interesting to test other prefilter alternatives in order to ensure we have the best possible combination in terms of efficiency and cost and to determine the necessary filtration level to avoid contamination of the adjacent sow herd. In this project, the MERV 13 prefilters were systematically changed at the end of each batch but it would be interesting to test them over more than one batch. Ways to divert the airflow away from the filtration system following the confirmation of the good health status should be developed to avoid the early clogging of the filters when they are not required.

Since this was a pilot project and that each individual situation may differ, it is important to consult both your veterinarian and your engineer specialized in ventilation and filtration before going forward with this type of building.

Acknowledgements

Partners who contributed to five different air filtration projects financially supported this project. The sector councils of Quebec, Ontario, Alberta, Manitoba and Saskatchewan, who administer the Canadian Agricultural Adaptation Program (CAAP) for Agriculture and Agri-Food Canada, provided a portion of project funding. This study was also funded by the Ministére de l'Agriculture, des Pêcheriés et de l'Alimentation du Québec (MAPAQ) under part 3 of the Programme d'appui financier pour un secteur agroalimentaire innovateur (Innovative Agri-Food Sector Support Program), Canadian Swine Health Board (CSHB), R. Robitaille et fils, Fédération des producteurs de porcs du Québec (FPPQ, Quebec Federation of Pork Producers), Ontario Pork, Manitoba Pork, Sask Pork, Alberta Pork, Institut universitaire de cardiologie et de pneumologie de Québec Research Centre affiliated to Université Laval, JSR Genetics, Prairie Swine Centre (PSCI) and Centre de développement du porc du Québec inc. (CDPQ, Quebec Centre for Pork Development).

Nutritional management of grow-finish pigs: energy and feed efficiency

Bernie Peet,
Pork Chain Consulting
Lacombe, Alberta

Dr. John Patience, speaking at the Saskatchewan Pork Symposium

Feed efficiency is a dangerous target when used in isolation, says Dr. John Patience, from the Department of Animal Science at Iowa State University. It is influenced by many feed composition factors, including, energy, amino acid concentration and nutrient balance in addition to feed processing factors and additives that are used. It is also influenced by environmental factors such as temperature, pig health, access to feed and the pig itself, in terms of growth rate, protein:lipid ratio, start and finish weights and mortality. What really matters is caloric efficiency, says Dr. Patience. AgriStats performance records for 30 million grow-finish hogs (during 2011) show that while FCE for Canadian pigs was 2.97 as compared to 2.72 for US pigs. Caloric efficiency was exactly the same at 9.2 Mcal/kg gain. FCE is different due to the higher energy concentration in corn, but Canadian pigs grow faster, due to their better health status in addition to lower feed cost, in terms of cost per Mcal energy, indicating that the critical issue in this comparison is the cost of calories, says Dr. Patience. Why feed efficiency should always be a secondary driver for management decisions in the grow-finish herd?

"The cost per Mcal went up from 2.7 cents to 11.8 comparing 2005 with 2012 so we need to think about the cost of energy differently," says Dr. Patience. "We also need to consider the relative cost of energy in different ingredients, for example the cost of energy from DDGS is far higher, at 14.5 cents/Mcal, than for corn at 11.8 cents. Therefore we need to know and monitor the cost of energy in the diet continually.

"One feed conversion point is now worth $.47 cents per pig compared with $.31 a few years ago, so we need to consider the value of FCE differently," Dr. Patience continues. "Over 50% of the cost of getting a pig to market is the energy component. And it's something producers have control over, so we need to pay more attention to it."

Energy level in the diet may have some performance implications. For example, research shows that increasing the ME content of the diet increases backfat thickness but has no effect of loin depth. Increasing the energy in the diet will increase growth rate, but only up to a point where it can't be increased any more. "Where is your farm?" asked Dr. Patience. "If energy is expensive, can we reduce energy level in the diet and still maintain growth or if we reduce energy intake, will this also reduce growth?" Unless energy intake is lowered excessively, carcass lean should not be impaired, but it can be reduced as energy intake declines if the decline is excessive, or if amino acid balance is not appropriately adjusted, he concludes. He notes that increasing the energy content of the diet will always improve feed efficiency.

About one-third of the energy that the pig eats goes to maintenance, 20% is used in protein deposition and 46% in fat gain, Dr Patience notes. "To maximize efficiency, we must reduce the energy spent for maintenance," he suggests. "This can be done by optimizing thermal comfort, minimizing social stressors and maintaining the highest possible health standards because fighting disease uses up energy." Maximizing growth rate by various means reduces the time spent in the barn, which results in fewer days of maintenance energy costs, he adds. Reducing maintenance energy costs increases the amount of energy that is directed towards lean gain.

The pigs' energy intake impacts how comfortable they feel in the barn, notes Dr. Patience. "Unthrifty pigs eat less than their healthy contemporaries and, because of this, they are chilled at a temperature that is perfectly comfortable for healthy pigs. Therefore, unthrifty pigs need to be kept in warmer and less drafty conditions, potentially providing localized heating or covering their lying area."

Dr. Patience believes that quality control in the pork production process should focus on outcomes such as growth rate, barn throughput and carcass quality and less on inputs such as

(Nutritional Management...Continued on Page 9)

Feeder space per pig in the finishing barn can have a significant impact on growth rate

diet composition. Having said that, he stresses that the feed production components should be checked to ensure that feed delivered to the pigs meets their requirements for daily nutrient intake. "We need to confirm the composition of incoming ingredients in terms of both desirable and undesirable constituents," he explains. "We also need to ensure that feed mixing is achieving a uniform mixture according to the formulation."

Feeder space allowance can have an impact on feed intake and growth, notes Dr. Patience. In a trial comparing 4.1, 4.9 and 5.7 cm space per pig for finishing pigs, final body weights were 121.5, 122.2 and 122.9 respectively. "Along with final body weight being decreased, daily gain was significantly reduced with decreasing feeder space," comments Dr. Patience. "As pigs grow and their shoulder width increases, the effective feeding space per pig decreases, thus impacting gain." There was also a trend for poorer feed efficiency as feeder space was reduced. "Although there was no difference in apparent daily feed intake, this could have been due to pigs having their mouths full of feed and backing up from the feeder and thus not utilizing the feed that supposedly disappeared," he suggests. Because of the impact of feeder space on growth, Dr. Patience believes that feeder space is much more critical economically when the cost of feed is high.

Dr. Patience concludes by stressing the need to pay more attention to the cost of energy in pig diets and to optimizing the efficiency of its use. "We must pay more attention to dietary energy because it is by far the most costly specification to meet in practical diets," he says. "We must also know the energy intake for our herds because herds differ widely in their daily energy intake and thus in their response to changes in dietary energy content."

The Canadian Society for Bioengineering presented a series of awards at its annual conference held at the University of Saskatchewan.

The graduate Thesis award was presented to Alvin Alvarado by Dr. Qiang Zhang (CSBE/SCGAB President). Alvin is a Research Associate for the Engineering group at Prairie Swine Centre.

Feeding Fusarium Contaminated Grain

Ken Engele
Prairie Swine Centre

At current feed prices, feeding diets containing 2 ppm of DON results in a reduction of $2.00/hog marketed to your operation (results calculated using the Prairie Swine Centre/George Morris Centre Enterprise model).

Fusarium head blight occurs when the right combination of environmental conditions exist. This includes rainfall immediately prior to heading in addition to ample heat and humidity throughout the flowering period. Several species of Fusarium have been identified to cause head blight of which a few produce mycotoxins. Throughout western Canada Fusarium graminearum is the most common, and represents the principal toxin producing DON (deoxynivalenol or vomatoxin).

With the 2013 harvest well on its way to completion pockets of fusarium have been reported in wheat throughout western Canada. It's important for pork producers to keep in mind the impacts of feeding DON contaminated grain, in addition to sampling procedures that can help minimize the impact of DON within their operation.

Research at the University of Manitoba has indicated that DON levels exceeding 1 to 2ppm have been shown to suppress feed intake in addition to reducing average daily gain. While different livestock respond differently to levels of DON in their diets, in pigs it is efficiently absorbed, poorly metabolized, and excreted slowly when compared to other livestock. Therefore making pigs quite susceptible to DON.

What can be done about feeding DON contaminated grain to pigs?

Agriculture Canada has set forth the following guidelines in feeding DON contaminated grain to swine:

(guidelines for DON intake are based on a 100% dry matter basis for the complete ration)

- feeding DON at levels above 1ppm in complete feed will result in some degree of feed refusal
- 5% feed refusal can be expected when levels of 1-2ppm are reported
- 25% feed refusal can be expected when DON exceeds 4ppm
- Vomiting is a rare occurrence, however can occur when DON is present at extremely elevated levels, greater than 20ppm
- Try and avoid feeding DON contaminated grain to weanling pigs, as they are more susceptible to elevated levels of DON. Feed refusal has been reported with levels less than 1ppm in weanling pigs
- Effects of DON on reproductive performance are not fully understood, therefore as a precautionary measure DON levels should be keep under 1ppm to minimize potential impacts on performance

Sampling and testing is another crucial component in determining a safe feeding program. When sampling grain, the general rule of thumb is, the more samples the better. Test results for DON will always experience a degree of variation because the mycotoxin we are testing for is not evenly distributed throughout storage, in addition DON will vary throughout the field.

The Bottom Line

At current feed prices, feeding diets containing 2 ppm of DON results in a reduction of $2.00/hog marketed to your operation (results calculated using the Prairie Swine Centre/George Morris Centre Enterprise model).

When feeding pigs with any level of known DON in the complete feed one should take great care and watch animal performance, as a reduction in feed intake may indicate DON levels are higher than what test results may report.

This information and more on feeding DON or mycotoxin contaminated grain can be found in the PorkInsight database. www.prairieswine.com/advanced-search/

Mycotoxins in Swine Diets
http://www.prairieswine.com/wp-content/uploads/2010/07/DON-Factsheet.pdf

Feeding Fusarium Contaminated Grain to Livestock
http://www.prairieswine.com/feeding-fusarium-contaminated-grain-to-livestock/

(Minimizing & Managing ... continued from page 3)

Table 3. Nutrient content and variation of ingredients in a typical swine finishing diet in Western Canada.

Ingredient	%[1]	$/mt[2]	Mcal/kg	Lys	Met	P
Wheat	24	293	3.800 ± 0.15	4.8 ± 0.04	2.5 ± 0.02	4.0 ± 0.03
Barley	25	257	3.150 ± 0.35	4.8 ± 0.05	2.0 ± 0.03	3.9 ± 0.04
Peas	30	257	3.504 ± 0.23	16.3 ± 0.18	2.1 ± 0.03	4.2 ± 0.06
Corn DDGS	10	372	3.355 ± 0.17	8.6 ± 0.08	6.2 ± 0.08	5.6 ± 0.11
Canola meal	8	320	3.779 ± 0.02	10.1 ± 0.05	3.8 ± 0.05	7.0 ± 0.14

[1]Diets contained mineral and vitamin premixes, limestone, lysine and threonine but it was assumed these ingredients did not alter the variation of the above nutrients in the final ration.
[2]Saskatchewan 2013.

For example, the NRC Nutrient Requirements of Swine (2012) has no estimation for the variation in energy content within different classes of wheat. The DE content of corn and corn DDGS is based upon 4 and 11 observations, respectively. Interestingly, data for AA availability is generally more complete, however ingredient composition and utilization was identified by the committee as a priority area for future research (NRC 2012). The relevance of "book values" for either nutrient content or the variation associated with reported averages has to be considered by each individual mill or producer. Local conditions can significantly affect nutrient content.

In a study conducted several years ago, (but probably still relevant, especially with changing climates) Suleiman and co-workers (1997) showed, using a large number of samples of barley grain, alfalfa and silages grown in Alberta, that the current NRC dairy (1989) values did not accurately predict nutrient content. The average concentration of Ca was 100% and CP 30% higher than the NRC values while Cu and Zn were only 18 to 40% of reported values. The authors concluded that, in Alberta, locally derived nutrient values should be used for ration (dairy cattle) formulation and moreover, the high CV's observed indicated that frequent analysis was required (Suleiman et al. 1997).

Prioritizing analyses however, can significantly reduce associated costs. This can be accomplished by calculating the contribution of each ingredient to nutrient variation and then, based on ingredient cost, the cost of the variation (Duncan 1988). Variation of nutrients in a ration can be estimated from variation of each ingredient by (Duncan 1988):

$SD = \sqrt{(X^1S^1)^2 + (X^2S^2)^2.....(XnSn)^2}$

SD = SD of the nutrient in the ration
Sn = SD of the nutrient in the nth ingredient
Xn = fraction of total nutrient contributed by the nth ingredient

Table 4. Cost of nutrient variation in a Western Canadian swine finishing diet, 2013.

Restriction	Cost of unit/$mt[1]	SD[2]	Cost of variation, $/mt[3]
DE, Mcal	0.079	0.12	0.009
Lysine, g/kg[4]	0.040	0.06	0.002
Methionine, g/kg[4]	0.110	0.02	0.002
Phosphorus, g/kg[4]	0.063	0.003	0.0002

[1]Only considering ingredients in Table 5.
[2]Standard deviation of the nutrient in the finished feed calculated as described above.
[3]SD time the cost.
[4]Total amino acids and phosphorus.

The contribution of each ingredient to final nutrient variation in a swine finishing diet was calculated using the data in Table 3. This calculation considers the cost of the variation in each nutrient, not the cost of the nutrient per se. Synthetic amino acids and minerals were assumed to have a negligible variation and were thus not included. As illustrated in Table 4, the cost of variation in energy is 3 to 4 times the cost of variation in other nutrients. Expending analytical dollars on the energy content of energy supplying ingredients would yield the highest return.

Logistical considerations

Table 4 indicates that variability in the cost of energy contributed more to the cost of variation in an example swine finishing diet than variation attributable to lysine, methionine and phosphorus combined, implying that analyzing high energy yielding nutrients for energy content would be a judicious use of resources to minimize ration costs associated with variation. However as well known by feed mill managers and producers mixing their own diets on farm, analyzing an ingredient and then segregating it until the results of the analysis are returned is very seldom a practical option. Advances in near-infrared spectroscopy (NIRS) however, are allowing the prediction of several nutrients, including energy (Zijlstra et al. 2011), rapidly enough that the use of these instruments may effectively mitigate some of the logistical problems of trying to adjust ration formulations to attain a consistent nutrient profile. Development and maintenance of calibration curves for various ingredients, however, remains an industry challenge.

The Bottom Line

The variation in ingredients available for use in livestock rations is real, of economic importance and unlikely to decline. The cost and risk associated with this variation depends among buyers and sellers. Understanding the source of the variation is important. If the perceived variation can be attributed to sampling or laboratory technique it can be reduced. If the variation is real it must be managed.

Reference for this article can be obtained by contacting Prairie Swine Centre at denise.beaulieu@usask.ca

Personal Profile

Helen Thoday

Helen Thoday joined the Prairie Swine Centre in May 2013. Helen's role covers managing the Contract Research in addition to developing and initiating social media aspects of Prairie Swine Centre's technology transfer program.

Originally from Wiltshire, UK Helen obtained a BSc (Hons) in Agriculture and Land and Farm Management from Harper Adams University. She then went onto join PIC covering many aspects of AI production, distribution and on farm use also completing further qualifications in Animal Physiology and Infectious Diseases. Helen then went to work for British Pig Executive (BPEX) as a Knowledge Transfer manager covering on farm advice and training on pig production. Both these roles involved communicating to pig producers about important aspects of their businesses which she is passionate about. Outside the main responsibilities Helen sat on national policy and lobbying boards for subjects such as preparing for change in legislative issues and the National Farmers Union's allied industry group which ensures efficient communication across the whole supply chain.

For two years Helen also worked on the Falkland Islands as an Agricultural Advisor covering ruminant production and specifically using the knowledge learnt in the pig industry to upgrade the sheep breeding and selection programmes on the islands.

Helen was awarded a Nuffield Farming Scholarship in 2010 covering the topic "The UK pig Industry 2020?" This took her to Brazil, America, China, Thailand and Europe to assess the current and future prospects of their pig industries. This gave Helen and insight into the challenges facing different regions and the focus of their production to meet their own environmental challenges, customer requirements and most importantly the health of their profits.

Samantha Ekanayake

Samantha Ekanayake is a Research Assistant at Prairie Swine Centre. His research work is related to prevention of swine from airborne infections during transport, and airborne disease outbreaks in swine facilities. The objective of his work is to design and develop an air filtration system for a swine transport trailer, and compile information on best management practices to prevent airborne disease outbreaks in swine. After obtaining a Bachelor's degree in Veterinary Science from the University of Sri Lanka in 1994, he served as a government range veterinarian in dairy cattle practice for five years, and later he serves his alma mater a as a lecturer in veterinary pathology for five years. As a Sri Lankan Veterinarian, he has been involved in curative and managements aspect of dairy cattle. He completed his Master of Science degree at the University of Saskatchewan, which was focused on identifying a viral disease in broiler chickens as a primary disease and its control by vaccination. He has gained shills in areas such as cell culture, virological techniques and animal experimentation. He hopes to contribute to research by identification and application of preventive methods to control diseases in livestock.

Coming Events

Saskatchewan Pork Industry Symposium
November 19-20, 2013
Saskatoon, Saskatchewan

Banff Pork Seminar
January 21-23, 2014
Banff, Alberta

Manitoba Hog Days
December 12, 2013
Brandon, Manitoba

PRAIRIE SWINE CENTRE

Centred on Swine is a semi-annual newsletter produced by Prairie Swine Centre Inc. (PSCI).

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

Tel:(306) 667-PIGS (7447)
Fax:(306) 955-2510
www.prairieswine.com

Prairie Swine Centre is an affiliate of University of Saskatchewan